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THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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VOL. XLI., No. 18. FRIDAY, NOVEMBER 2, 1906.

The disaster at Atlantic City, N. J., last Sunday may have to be classed with the small number of unexplainable railroad accidents, for the officers of the Pennsylvania Railroad declare that they have been unable to discover its cause, and the coroner and others who have tried to believe that they knew it have produced no coherent evidence to substantiate their opinions. The first right-hand rail on the draw span was found displaced after the accident, but the evidence seems more in favor of the theory that this was caused by the derailment than that the derailment was caused by it. The fact that the bridge was nearly new and yet had been in service several weeks, is in favor of the assumption that it was sound; and the assertion of the officers of the road that the structure was first class in design, material and workmanship is buttressed by the known excellence of all new work of that kind done by the Pennsylvania Railroad. This disaster may arouse the prejudiced feeling that the electrical operation of steam railroads is a risky experiment, based on the idea that all untried things are necessarily dangerous. For this superficial view there is no ground whatever, though it is, unhappily, true that had a hundred tons of engine and tender been in front of the train it would have formed a barrier which might have broken the fall of the passenger cars and thereby protected the passengers. The line was straight, and there is no suggestion that the motorman was at fault. There was no fog or darkness to impair his view or his efficiency. It is just ten years and three months since the crossing collision at Atlantic City, which killed 47 persons and injured 50; but it is only two years and one month since we had in this country a railroad disaster equally appalling—the butting collision at Newmarket, Tenn., in September, 1904, when 63 were killed. In August, 1904, the flood disaster at Eden, Colo., killed 88.

The appointment by the Rock Island and Frisco systems of a new officer bearing the title of "Commerce Counsel," whose duty is to co-work and harmonize things with the Interstate Commerce and the State Railroad Commissions, has several suggestive features. It bears evidence (1) of the logical tendency toward specialization which affects railroads and all other great institutions as they become functionally more complex; (2) of the increased activity and force of federal and state regulation, and (3) of a new office the incumbent of which must have peculiar and somewhat versatile traits, mental and otherwise. He must be a lawyer and know statutes and legal precedents; he must be familiar with railroad operation, especially in that branch that includes rates; he must be tactful and, in a technical sense, what we call in social life a "good mixer." But, assuming that the office, or a similar one, is to be created by other railroad corporations, the horizon widens to larger questions of railroad policy. About four-fifths of the states now have railroad commissions, some active, some passive; some with high powers, some with low powers. As regards the states where commissions are assertive we are likely to see, for obvious reasons, a tendency toward the creating of the new "harmonizing" office, while in states with inactive commissions—though a good many of them have high statutory powers—the railroad policy will be to let sleeping dogs continue to slumber. West and south we shall see the new mechanisms of harmony, in eastern states few or none. Such at least is the case so far as the state railroad commissions affect it. A more optimistic view of the matter is that a "Commerce Counsel," or cognate officer of a railroad system, forms in a sense a new connecting link between the federal and state commissions to the advantage of both as well as of the railroads and their patrons. The state commissions have already learned much from the interstate body, and from it has come a very appreciable influence toward unifying the organization, the duties and the rulings of state bodies still very heterogeneous. Any new force tending to make the commissions homogeneous is to be welcomed, especially by the railroads that traverse several states. Protectively and as against the state's supervisors of railroads the place of Commerce Counsel or its equivalent ought to be an indirect restraint on these public officers.

The pressing need of an increase in the rate per day for interchanged freight cars is at last thoroughly appreciated by a large number of important railroads. Whether it will be practicable to make any widespread change before next June is another and a difficult question. Notwithstanding the abuses of low rates for interchange and for demurrage and the improper use of cars by railroads and by consignees or shippers, it must still be admitted that in providing inflexible regulations for a business which imperatively demands flexibility trouble must be expected. No general uniform car service rate can avoid resulting in certain cases unjustly. At the meeting of the American Railway Association last week the committee on car service recommended an increase of the rate from 25 cents a day to

35 cents, an increase so large that a year ago it would have aroused vigorous opposition from a large majority of the members of the association; yet to-day it is loudly opposed as too small. A dozen roads met in Chicago, October 16, and voted in favor of 50 cents "at the earliest possible date," and again just before the convention a larger and more influential "caucus" brought out even stronger views. Among the roads in favor of an increased rate at once are the North-Western, the St. Paul, the Rock Island, the Atchison, the Illinois Central, the Union and the Southern Pacific, the Erie and the Pennsylvania; and a conference is to be held in Chicago, November 9, to see what can be done. Short terminal roads, some of them influential, will, of course, object to an increase, and the question is whether a workable plan, not liable to destroy itself by its own friction, can be agreed upon. With numbers of roads helpless, while their millions of dollars' worth of new freight cars are being wrongfully used by conscienceless borrowers for their own profit, there must be a strong sentiment for a change. The adoption of a higher rate by a few, or many, roads independent of the Association would at least call for a stirring up of the car accounting offices, and that in itself would be a good thing, for the feeling that freight car records cannot be kept as carefully and fully as records of passenger cars is one of the obstacles in the way of car-service progress. The most encouraging thing that we have seen recently in the freight car world is the statement that one big road has taken a large number of agents out of the soliciting field and set them to hunting freight cars and prodding consignees. This is reported to have been highly effective in releasing cars. One local agent who really stirred up his consignees reduced the cars on his team track about 75 per cent. in a short time. This is not car interchange, but it is a kind of work that greatly ameliorates the troubles of car interchange.

President Delano, of the Wabash, believes that there is about to be another general advance in the wages of railroad employees. The present great prosperity of the country tends in several different ways to make the lower ranks of railroad men dissatisfied. In the first place they naturally want a larger share of it. Railroad earnings have been increasing at a wonderful rate, dividend payments have been begun or enlarged, and the man who moves the traffic feels that to him should come part of the increase. More than this, the cost of living has greatly increased, and he feels sharply the added cost of the things for which most of his pay must be spent. These two reasons apply in general to all classes of workmen. There is a third reason applicable, more especially to the railroad man—namely, that as a result of the great volume of business he is worked harder. The rush of traffic which came to the railroads in 1905 was exceptional, and was generally handled in emergency fashion, meaning long hours and great strain on the operating force. But the expected return to normal has not come. Instead an even greater traffic is to-day being handled. The movement for a readjustment of railroad wage schedules is already under way. In Chicago the Switchmen's Union is demanding better terms from all the railroads entering that city. The Pennsylvania Lines west and their trainmen are discussing wages and hours. In the east the New York Central, Lackawanna, Central of New Jersey, Reading and Erie are treating with conference committees of their train and yard employees. There is no serious talk of strikes yet and small occasion for anxiety. Every year at about this time many railroads talk over and adjust wage schedules with their employees in a friendly spirit, and some of the negotiations now on were arranged long ago. But the fact remains that the feeling on the part of the men is general and widespread throughout the country. The railroads, however, as evidenced by President Delano, are disposed to treat the demands fairly and as far as possible adjust all differences.

MECHANICAL TRACK INSPECTION.

Periodical track inspection is desirable, for without it intelligent distribution of maintenance work where it is most needed cannot be made. Many roads now have an annual inspection in the Fall when the track has been put up in good shape for the Winter. A committee of officers goes over the line on a special car or train; one is usually assigned to note surface, another alinement, another curves, another neatness, etc. They mark each section, sub-division and division according to their own standards of perfection and at the end of the day or the trip a general average is made up of all the markings. Where premiums are awarded this method is used for selecting the prize winners. These inspections stimulate healthy competition among the men in charge of maintenance, but the personal co-efficient introduced by relying on the individual judgment of a number of different men makes really accurate comparisons of the actual condition of the track from year to year out of the question. The track inspection car of the Baltimore & Ohio, which is described in another column, gives a permanent record, without appreciable error, showing the result of maintenance work during any period. While it does not replace the general officer's inspection which should, and usually does, include all the machinery of transportation, it is an almost invaluable aid.

When the car was first run over the road the trackmen were inclined to doubt its accuracy in spotting low joints and variations in gage. By stopping the car and making a few check measurements on the track whenever the record was questioned the men were convinced that in the essential matters of surface and gage the mechanism was as accurate as their track levels and gages. Having accepted the records as correct they put to good use the information thus obtained and put extra work on the track where it most needed attention. The marked improvement in track on the Baltimore & Ohio during the last three years is in great part due to this intelligent direction of effort. Of course, this car is not directly responsible for the improvement; it takes money to make good track and in this case money has been spent liberally and in increasing amounts. In 1903 the expenditures for maintenance, excluding the cost of rail and tie renewals, was $934 per mile, $982 in 1904, $1,044 in 1905 and $1,260 in 1906.

It may be urged as an objection to the use of a car of this kind in making periodical inspections that in the effort to make a good record the supervisors spend their time two or three weeks in advance of the car's arrival in their district in "varnishing" the track. This is undoubtedly done and is bad practice, but no amount of varnishing can make really good track out of normally bad track. In any event the record is of value chiefly for comparison, and if the amount of varnishing is nearly constant before each inspection the true condition of the track can be compared from year to year, making due allowances for the extra work done to cover up bad places. Further, varnishing does no harm even if it does small good.

THE DEVELOPMENT OF THE LONG ISLAND RAILROAD.

The art of railroading is not at all confined to economical management and wise construction. There is another department of which Mr. Peters, President of the Long Island Railroad, is now furnishing an excellent example, in many respects like that of Mr. Hawks, President of the Detroit & Mackinac road, described several years ago in these columns. The Long Island has always been unprofitable, primarily for the reason that it was a summer road only. Employing great additions to the force in the spring and discharging them in the fall, offers little inducement to the young railroad man who wants to get on, and this, to a large extent, shuts off the Long Island from building up a staff of trained young men ready for vacancies in important places. During the short period of Mr. Peters' administration he has shown that he has a grasp of the situation and is trying to overcome it by methods that are interesting and worth noting. He has already electrified 122 route miles reaching to the outlying districts beyond the borough lines. This does not produce an adequate return on the costs but there are already indications that it may produce large return. The building of moderate priced houses is going on at a wonderful rate and in one case a whole community, bound together by ties of religion, are moving their living places from near the East river to the outlying district. In many other cases more important homes are in course of construction for well-to-do people. Old towns are growing and new ones are being made; all this within a time distance of less than an hour from City Hall.

Side by side with this expenditure of large sums of money for getting new business and handling it, there is going on a thorough study of the capabilities of Long Island both for pleasure and for profit. There are now more than 200,000 acres of land with rich soil, capable of being made into market gardens sufficient to supply Greater New York, and with a decided advantage of quick and inexpensive transportation directly to the consumers. The sandy portions of the island were originally covered by pine which has been cut away and replaced largely by a stunted growth of pine. The arable acres were covered with broad-leaved trees, largely white oak, black oak and chestnut. This has been lumbered for profit three times since the island has been inhabited.

but of late years the trees have not been allowed to grow to commercial sizes of lumber before they are cut for firewood, so that this land is covered by scrub trees, producing little or nothing. This waste is painful to the railroad officer who wants to see every acre along his line make for transportation, and, therefore, for experimental purposes the company bought two tracts, one of 18 acres, the other of 80 acres of rather undesirable looking land, paying for it only $15 an acre, and put it in the hands of an expert who cleared it and planted it and kept an exact account of the whole cost. The result was proof that a market gardener can make money there and include the value of his own time in the costs of operation. Having learned this much the Long Island company has not been slow to make it known not only to the people throughout the island, but to those who are capable of conducting a market gardening business. The results are promising. This is simply one of the many schemes being tried to induce settled residence on Long Island, to the end of adding largely to the permanent population and making an all-through-the-year business for the road. In addition to this there are many other schemes for the same purpose. The island is so located that it would seem at first sight idle to undertake to make it a manufacturing region, for the reason that all raw material as well as finished material has a long haul. Nevertheless the company's staff are studying this out and find branches of manufacture where cheap land, a healthy region, and any degree of isolation that is desirable, would be strong attractions to the manufacturer.

Among the several devices for attracting people to come along the line of the road for pleasure purposes the most novel one is a present undertaking to build a 60-mile speedway for automobilists. The location and construction of this speedway will be such that there will be no grade crossing either of a road or railroad throughout its length. It will be fenced and probably have entrance gates five or ten miles apart. Its cost is guessed at a million and a half dollars. Of course it is not proposed that the company shall pay this cost, although it may be a modest subscriber to the capital stock. It is initiated, carefully studied out as to location and methods of using it as a toll road for automobilists by the company officers, and the results of this study have been submitted by Mr. Peters to a meeting of enthusiastic motorists who can well afford to furnish the money and have been found quite willing to do so. Alertness and skill and initiative in developing a country to the end of conferring a blessing on the public, and dividends to the stockholders of an unprofitable road, is quite as worthy of the efforts of men of high talent as is any department of the planning and operation of a railroad.

LOCOMOTIVE PERFORMANCE.

The satisfactory performance of the single expansion steam locomotive becomes more apparent as facts derived from accurate tests accumulate. From being regarded as a wasteful machine, the American locomotive is now coming to be looked upon as a machine of high efficiency. It was shown by the Purdue laboratory tests a dozen years ago that when all conditions were exceptionally favorable, the steam consumption per indicated horse-power hour could be brought as low as 25 pounds. Statements to this effect have since been confirmed by results of tests obtained by the Pennsylvania Railroad at St. Louis involving a number of different locomotives. The report of these tests shows that a simple locomotive will operate on no more than 23.7 pounds of saturated steam per horse-power per hour. Values approaching this limit have been regarded as exceptional, and it has been assumed that under ordinary conditions of service the consumption is far in excess of the value quoted. In other words, while it is admitted that high performance may be obtained under test conditions, it has been generally believed that the locomotive sustains its reputation for wastefulness under service conditions. It is upon this point that new evidence is soon to appear. Work but recently completed at the Purdue laboratory justifies the statement that whenever the conditions of running are such that the throttle may be wide open, steam consumption is not far above the minimum. For example, there has been run a series of fifteen efficiency tests, all under a wide open throttle, the boiler pressure being 180 pounds. The series represented speeds ranging from 20 to 60 miles an hour and all positions of the reverse lever which were possible with a wide open throttle at the speeds selected. The results are, therefore, comparable with those which may be, and doubtless are obtained in daily service on the road. They show a minimum consumption of 23.7 pounds of steam per horse-power hour, and a maximum of but 28.8 pounds. In passing from the most economical to the most wasteful condition of running under a wide open throttle, the steam consumption was increased by but 5 pounds, or 22 per cent. It appears from these and similar series of tests that so long as a locomotive is fairly well maintained and so long as it is operated under a wide open throttle, it cannot be really wasteful in its use of steam. Single expansion stationary engines, even of large size, when subjected to variations in load, cannot show a better performance than this.

Another phase of the performance of locomotives, concerning which there have been many conflicting opinions, is the advantage derived from high steam pressures. The question has been under investigation by Purdue University under the patronage of the Carnegie Institution of Washington. An account of these researches has been reported to the Carnegie Institution, and is soon to be issued in book form. While a full understanding of the results must necessarily await the issue of the forthcoming volume, the tests have served to define the steam consumption per horse-power hour, for different pressures as follow:

Boiler pressure.	Steam per H. P. hour.	Differences Pounds.	Differences Percentages.
120	29.1	...	...
140	27.7	1.4	4.8
160	26.6	1.1	3.4
180	26.0	0.6	2.2
200	25.5	0.5	2.0
220	25.1	0.4	1.6
240	24.7	0.4	1.6

The columns of differences show the amount by which the steam consumption is reduced for each 20-pound increment in pressure. For example, an increase from 180 pounds to 200 pounds pressure reduces the steam consumption one-half pound, which is but 2 per cent. of the steam consumed at 180 pounds. Small as are the values in these columns of differences, they are in excess of the true measure since a true measure should be based upon heat consumption rather than upon the weight of steam used. As the pressure is increased, more heat is required for the generation of each pound of steam, so that the gain which appears in the record of steam consumed is in part apparent. But under the range of pressures dealt with, the difference between the true measure and pounds of steam per horse-power hour is small. It is significant, of course, that its effect, if applied as a correction, would be to reduce the value of the differences given above, as the pressure is increased. These values considered in connection with losses occurring through increase in leakage as the pressure is raised, constitute poor arguments in favor of the further increase of boiler pressue, if, indeed, they do not suggest the advantage of pressures which are lower than those now common.

Choice of steam pressure is a question of design. When the pressure is assumed, the cylinders may be proportioned to transmit to the wheels such force as may be desired. This fact will generally make it inexpedient to change the pressure in existing locomotives, except in cases where locomotives under the present pressure are over cylindered.

The Pennsylvania testing plant which was used at the St. Louis Exposition has now been put in commission at Altoona. A large building has been erected for its reception, the plant has been installed and locomotives are now operating on it. It would be an admirable thing for the railroads of the country, and, incidentally, for the Pennsylvania Railroad System, if some scheme of co-operation could be secured between the railroad company and the Master Mechanics' Association whereby such portions of the work accomplished upon the plant as may be of general interest and free from all spirit of competition, could be reported to the Association. The advantages of such a plan to the Association would easily justify the expense of maintaining an expert as its reporter at the plant. The Pennsylvania Railroad would lose nothing, but would gain through the work of the Association's expert aid, and as the result of public discussion of its methods and results.

Northern Pacific.

It was no longer ago than 1898 that the Northern Pacific directors were making a special appropriation out of income "as a reserve for the continuity of dividends upon the preferred stock" which now, converted into common shares, sells at over 200. It was less than two years earlier that the road, then earning something like $20,000,000 gross and $7,000,000 net a year, and having rolled up a total deficit of over $14,000,000 in three years, was, after reorganization, taken over by the present company. Among all the marvelous instances of growth within a decade from railroad bankruptcy to railroad prosperity, none has been more remarkable

than that of the Northern Pacific. With an increase since 1896 of less than 1,000 miles in operated mileage, gross earnings have risen to over $61,000,000 and net to over $30,000,000. To put it briefly, net earnings are a third larger than gross were in 1896.

The fiscal year 1906 proves to be the banner year in this remarkable upward progress. A year ago gross earnings for the first time passed the $50,000,000 mark. Last year they increased $10,500,000 to over $61,000,000, a gain of more than 20 per cent. Instead of using all the added earnings in increased operating expenses like the Burlington, whose annual report was reviewed in these columns last week, less than half of the gain was used in larger outlays, so that there was an increase of over $6,200,000, or more than 25 per cent. in net earnings. These evidences of prosperity are the more remarkable in view of the then wonderful gains of 1905, when gross earnings increased over $4,000,000 and net earnings over $1,600,000.

Nearly three-quarters of the $4,200,000 increase in operating expenses was in conducting transportation. Maintenance of way stands at almost the same figure as in 1905. There was a gain of $890,000, or 17 per cent., in maintenance of equipment. No detailed statement of expense is given, so that figures of maintenance per equipment unit cannot be worked out, but maintenance of way cost $1,387 per mile against $1,382 in 1905. Again, without detailed figures of expenses it is impossible to accurately locate the reasons for the increase of 25 per cent. in cost of conducting transportation. Train load certainly played no part in bringing it about, for the average revenue load increased from 366 tons in 1905 to 400 tons last year. Including company freight, the train load was 468 tons, a high figure for a 5,000-mile road. There is, however, another factor which accounts for part of the increased cost of carrying the traffic; namely, an increase in the percentage of "helping" to revenue train mileage in both the passenger and freight department. The fact that freight helping mileage made up last year 16 per cent. of the revenue train mileage shows that there is much work still to be done before the road has satisfactory grades and curvature.

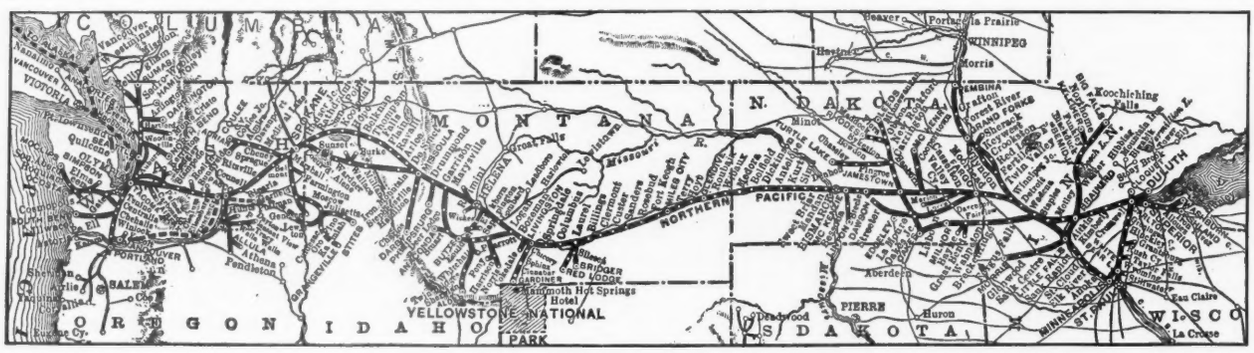
Passenger results were most favorable, due in part to the effect of the Portland Exposition, the latter half of which was included in the fiscal year. The long distance Exposition travel is shown by comparison of the gain in number of passengers carried with the number of passengers carried one mile. With 15 per cent. more passengers carried, there was an increase of 35 per cent. in the number of passenger miles, and the average distance traveled by each passenger rose from 95 to 111 miles. Including mail and express, passenger department earnings were $16,244,695 against $13,076,377 in 1905, a gain of 24 per cent. Increases in the freight department were not quite as large proportionately. There were 18 per cent. more tons of revenue freight carried and 20 per cent. more revenue ton miles. The average haul increased from 334 miles to 341 miles. Freight department earnings increased $7,180,335, or 19 per cent. There was an increase per mile of road of $547 in passenger and $1,219 in freight earnings.

The income account shows the strong financial position of this not long ago bankrupt property and the large extent to which reconstruction is being paid for out of surplus earnings. After all payments for taxes, bond interest and rentals, there was a net income before dividends of $22,500,000, which is over $5,000,000 larger than in the previous year. The same amount was paid out in dividends as in 1905, so that if appropriations for betterment out of income had been no larger than in that year, there would have been a profit and loss surplus for the year larger by $5,000,000 than in the fat year 1905.

It was in the first full fiscal year in which the road was operated by the present management, covering the 12 months ended June 30, 1898, that the first modest charge of a little more than $800,000 was made against earnings for additions and improvements. In every year since that, more than $2,000,000, and in most years as much as $3,000,000, has been thus appropriated. Last year in addition to what has come to be the regular annual charge of $3,000,000 against income for betterments, $2,000,000 was appropriated for depreciation of equipment and over $1,000,000 for the insurance fund, making a total spending of over $6,000,000 out of earnings for betterments, depreciation and insurance, as against $3,000,000 in 1905.

The average operated mileage on June 30, 1906, was 104 miles more than on the same date a year earlier. Most of the new line was in four branches: The Fargo & Southwestern branch from Edgeley to Streeter, N. Dak., 40 miles; the Sykeston branch from Denhoff to Turtle Lake, N. Dak., 31 miles; the Peninsular branch from Hoquiam to Moclips, Wash., 28 miles, and the Sunnyside branch from Toppenish to Sunnyside, Wash., 12 miles. The report deals with important new construction under way. The Portland & Seattle, as has often been described in the *Railroad Gazette*, is building a low grade line from Portland, Ore., up the north bank of the Columbia river to Pasco, Wash., and thence to Spokane. Another arm of this road is also being built from a point 24 miles east of Pasco, where the Spokane line is to diverge, east along the Snake river to Texas Ferry, Wash., where it connects with a joint line now being built under the direction of the Union Pacific and owned by the Northern Pacific and Union Pacific jointly. This joint line runs from Texas Ferry to Lewiston, Idaho, just across the state line, 72 miles. It is to be finished in 1907 and have a grade of 11 ft. to the mile against eastbound traffic. From Lewiston a Northern Pacific line runs to Culdesac, and from Culdesac the Northern Pacific is building a line to Grangeville, Idaho, 55 miles. This is well under way and is to be finished in 1907. Heavy grades are necessary to bring it from the Snake river valley to the top of the plateau, the maximum ascending grade being 3 per cent. to the top of the plateau and then 1 per cent. This line also will be owned by the Northern Pacific and Union Pacific jointly.

More important than these joint lines in a local territory



Northern Pacific.

so long in dispute between the Hill and Harriman systems, is the projected through line of the Portland & Seattle from Spokane to Portland. The Portland & Seattle was incorporated August 22, 1905, and is owned jointly by the Northern Pacific and the Great Northern. The Northern Pacific already runs from Spokane to Pasco, so that the Spokane end of the line will not be built until the Portland connection is open. From Pasco to Portland the route parallels the line of the Oregon Railroad & Navigation Company along the Oregon bank of the river. On its completion, the Hill roads instead of having a roundabout route with heavy grades to Portland via Puget Sound will have a direct and efficient water grade line. It is being built to a very high standard and involves a great deal of expensive work. From Portland to a point 17 miles east of Vancouver, Wash., and from Kennewick, opposite Pasco, to a point 23 miles west, the road will be double-track, making 47 miles of double-track, in which are included double-track steel bridges over the Columbia and Willamette rivers. It will have a maximum grade eastbound of 11 ft. to the mile from Vancouver, on the north bank of the Columbia river opposite Portland, east to Texas Ferry, on the Snake river, and will be 10 ft. above the high water level reached in 1894. From a point 24 miles east of Pasco, where the road to Spokane diverges, the maximum grade northbound will be 22 ft. to the mile. The curvature on the whole line will be low, with few grades higher than 3 degrees. The total number of miles which is being built by the Portland & Seattle is 423. This line of low grades and light curvature will permit the handling of a large amount of business, both freight and passenger, between Spokane and points west and north of Vancouver, and will relieve the present congestion through the Yakima valley and over the Cascade mountains. Valuable terminal property has been bought in Portland and Vancouver, and it is expected that the line from Portland to Pasco and Texas Ferry will be finished by the autumn of 1907, and the line from Pasco to Spokane in operation early in 1908. Great efforts have been made, supposedly by

the Harriman forces, to block its construction, and at the present moment a rival company—the Wallula Pacific—claims to hold a franchise covering the route of the Portland & Seattle along the Columbia river to Portland. In spite, however, of the numerous conflicts which have taken place between the two parties, both in the courts and on the ground, construction of this new Hill outlet to Pacific tidewater seems assured. As suggesting the importance of this project there is already a new charge on the Northern Pacific balance sheet this year of $5,600,000 against the Portland & Seattle.

In other ways, it is evident that the management is actively attacking the problem of bettering the lines. There are 10 separate stretches of grade revisions or double-track described in the report. There are also other improvements under way. Forty steel bridges are under construction. Large bridges over the Missouri river at Bismarck and over the Columbia river at Pasco are now completed. The joint Northern Pacific-Great Northern passenger station at Seattle was put into service May 10, 1906. A large brick freight house at Seattle which was put in service in June, 1905, having already proved inadequate, a new freight house two-thirds as large is now under construction, to be finished this year. Two tie treating plants are being built, each to have a capacity of treating 900,000 ties a year, one at Brainerd, Minn., and one at Sand Point, Idaho. A new road is building, by the Great Northern, to make a connection between the Chicago, Burlington & Quincy and with its own lines at Great Falls, Montana. This will connect with the Northern Pacific at Laurel, 15 miles west of Billings. Billings is growing rapidly and the crowded terminal facilities divide the city into two parts. On account of the large and growing interchange of business between the Northern Pacific and the Burlington and the prospective business between the Burlington and the Great Northern, the Northern Pacific's division terminal is to be moved to Laurel, where land has been bought and construction is to be shortly begun. A large tract of land has been bought at Pasco, Wash., where a yard and freight terminal will be built for the joint use of the Northern Pacific and the Portland & Seattle.

The principal results of operation for the last two years are as follows:

	1906.	1905.
Mileage worked	5,401	5,315
Freight earnings	$44,041,467	$36,861,132
Passenger earnings	14,368,221	11,334,852
Gross earnings	61,223,476	50,722,886
Maint. way and structures	7,493,730	7,345,821
Maint. of equipment	5,944,119	5,053,586
Conducting transportation	15,673,348	12,565,740
Operating expenses	31,095,432	26,808,759
Net earnings	30,128,043	23,914,127
Net income	22,487,741	17,126,241
Appropriated: betterments, &c.	6,081,980	3,000,000
Year's surplus.	5,555,760	3,276,242

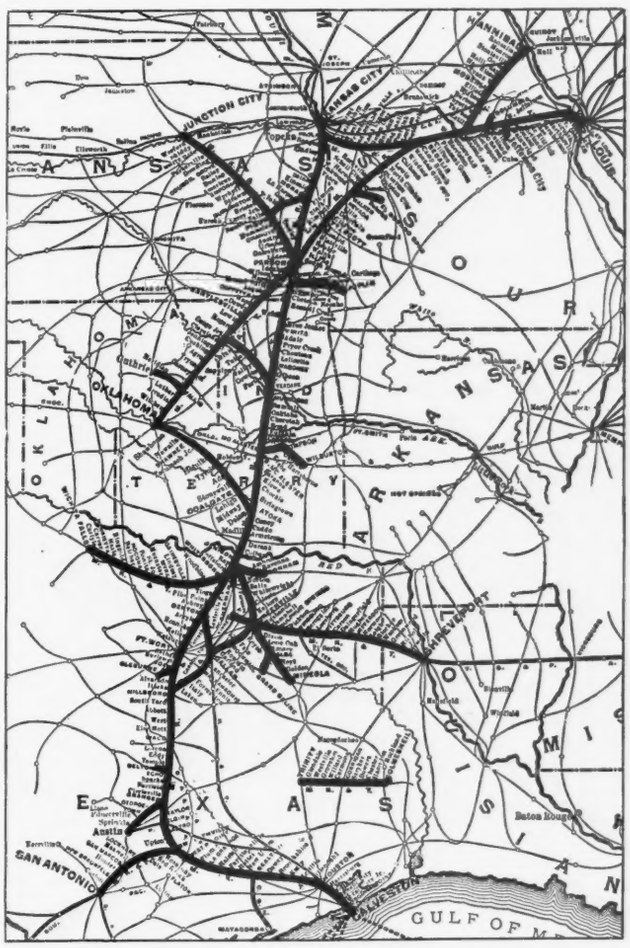
Missouri, Kansas & Texas.

A year ago the statement was made in the annual report that, owing to the defective plan of reorganization which made it necessary to apply to improvement of the property all surplus revenue and to use the company's credit in paying for necessary equipment, dividends could not be thought of until the equipment notes were met and cancelled. Owing, however, to the rapidly increasing credit of the company and the prosperity which it has continued to enjoy during the past year, a first semi-annual payment of 2 per cent. was made on May 10 on the preferred stock. The conditions referred to in the last report as precluding an immediate consideration of such a dividend were previously removed by the sale of $10,000,000 general mortgage 4½ per cent. bonds. These bonds provided funds for retirement of the equipment obligations amounting to a little more than $4,000,000 outstanding on January 1, 1906, the date of the mortgage, and serve to reimburse the treasury for expenditures made and to be made in reduction of grades, betterment of alinements, rail renewals and other improvements to the line north of the Texas boundary. The proceeds of these bonds have substantially relieved the existing and prospective drain on current revenues caused by the necessity of providing out of earnings for the large equipment payments and betterments. As the case now stands betterments north of the Red river—that is, on the lines which do not fall under the jurisdiction of the Texas Railway Commission—may be capitalized. The beginning of dividends marks the full return to prosperity of the Missouri, Kansas & Texas. Previous earnings were satisfactory, but there was the constant handicap that the expense of improvements could not be met except out of a small surplus.

The gross earnings of the year were over $21,000,000, an increase of $1,118,050 over 1905. Of this increase $834,499 came from freight and $222,289 from passenger traffic. Operating expenses were larger by $422,000, and net earnings increased by $696,188. The operating ratio was 73 per cent., against 75 per cent. in 1905. Even after the new charge of $260,000 against income for the semi-annual dividend of 2 per cent. on the preferred stock, there was a profit and loss balance for the year of $798,424 against $29,000 in 1905.

The increase in passenger earnings is notable, in view of the fact that the previous year included the large traffic of the closing months of the St. Louis Exposition. The increase of only $110,000 in conducting transportation expenses is also noticeable as indicating efficiency in handling the larger traffic, especially as $101,000 of it is, according to the company's statement, due to the coal strike. A supply of 151,000 tons of coal was laid in, and the extra fuel cost was due to double handling and the higher price paid. Reduction of operating cost was also helped by improvement in car and train loading, the revenue tons per car mile being 14.2, against 13.4 in 1905, and the revenue train load 218 tons, as against 205 tons in 1905. There were also small increases in the average car mileage per car per day and in the per cent. of loaded to empty car mileage. Maintenance of way cost $1,231 per mile, as compared with $1,197 in 1905 and $933 in 1904.

Coal furnished a considerably smaller percentage of the total traffic than in 1905, both on account of the strike and because the territory for the sale of coal mined along the road was somewhat restricted by withdrawal of coal rates by the Missouri Pacific and Rock Island. The tonnage of grain was nearly doubled, as well as its percentage of the total traffic. There were 1,057,465 tons of



Missouri, Kansas & Texas.

manufactures and merchandise carried, against 971,684 tons in 1905. The report mentions that there has been a marked increase in the traffic of new lines in Oklahoma, in spite of the coal strike, the shortage in the cotton crop and almost complete suspension of activity in the oil field. Freight rates were better maintained throughout the year by all competing lines than at any previous time. Mail earnings were increased by $125,000 by putting on a fast mail train from Parsons, Kan., to Denison, Tex., running in connection with the Frisco system.

Reduction of grades north of the Red river, which is necessary before any large increase in train load can be made, is now actively under way. Between Atoka, Ind. T., and the Red river, 50 miles, a north and southbound maximum grade of four-tenths of 1 per cent. compensated is to be obtained. Original estimates were to reduce grades to 0.5 of 1 per cent. southbound, and allow northbound grades to remain at 1 per cent. compensated. North from the Red river there will be a new line with 0.4 per cent. grade compensated for eight miles, which will be used by northbound trains, making a double track on that part of the road. It is expected that the whole work between the Red river and Atoka will be finished in 1907.

Surveys are now being made between Atoka and McAlester, Ind. T., and improvement of this part of the line is soon to be begun.

Work on the new shops at Parsons, Kan., has been under way during the year, the necessary grounds secured, the site graded, sewer work completed, foundation for the main erecting shop, blacksmith shop and paint shop laid and erection of steel structures under way. These shops are to be in operation by the end of the calendar year. A large freight house has been built in Kansas City, ground for which was acquired at the time of last year's report. Part of the filling for the Kansas City freight terminal has been done in the outer yards, where a roundhouse and other locomotive facilities have been built. No new mileage was built or acquired during the fiscal year, but on the first day of the present fiscal year (July 1, 1906) joint operation of 30 miles of track of the International & Great Northern between Austin, Tex., and San Marcos was begun under a fifty-year contract. This gives an outlet southwest from Austin and makes a saving in distance and time between San Antonio and northern points.

The Missouri, Kansas City & Texas has the advantage, as well as the disadvantage, of being an independent line. It is handicapped because its competitors are most of them parts of one of the larger and stronger systems. On the other hand, it is especially popular in its territory, probably because it is not controlled by one of the larger corporations. Every increase in the proportion of grain sent for export via the Gulf will be to its advantage, for it connects Kansas City with Galveston over a line which is now reasonably efficient, and which is to be made more so. Its financial requirements are for the time being met by the new bond issue and dividends have been begun on its stock. Provided the Southwest continues to increase in wealth and prosperity at its present rate, the road appears to have a bright future before it.

The principal results of operation for the last two years are as follows:

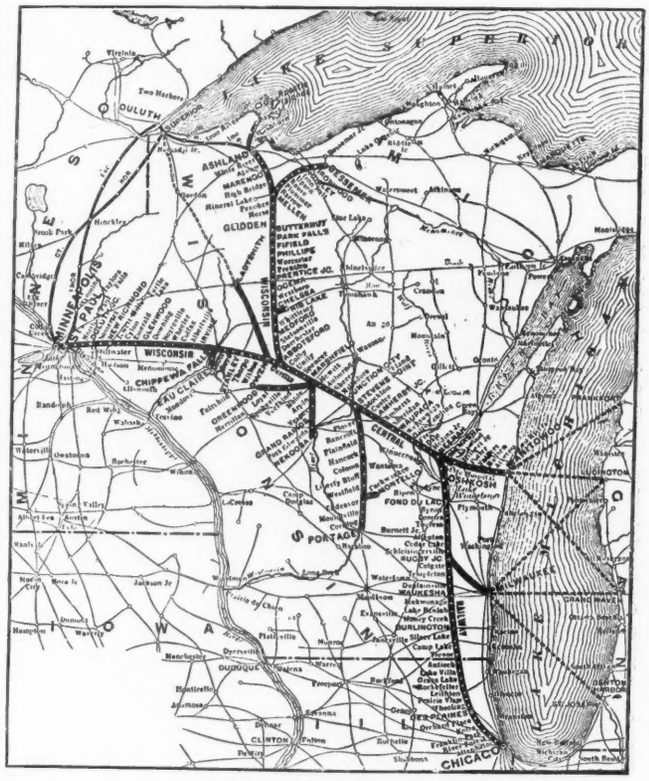
	1906.	1905.
Mileage worked	3,043	3,043
Freight earnings	$14,968,834	$14,134,335
Passenger earnings	5,157,881	4,93,,,92
Gross earnings	21,159,145	20,011,095
Maint. way and structures	3,746,241	3,643,201
Maint. of equipment	2,044,313	1,925,195
Conducting transportation	8,224,348	8,114,061
Operating expenses	14,990,298	14,568,436
Net earnings	6,168,847	5,472,659
Net income	1,653,088	1,267,191
Year's surplus	798,424	29,049

Wisconsin Central.

The Wisconsin Central runs from Chicago north and northwest to St. Paul and Minneapolis, with branches from Abbottsford, Wis., north to Ashland on Lake Superior, and from Menasha east to Manitowoc on Lake Michigan. It owns and operates 917 miles of road, including the branches mentioned and shorter branches, and has 60 miles of trackage rights. A line is being built from Owen, Wis., northwest to Duluth, 100 miles. On this line the 42-mile section from Owen to Ladysmith, built by a subsidiary company, the Owen & Northern, was opened to traffic on August 6th of this year. The rest of the extension is being built by the Lake Superior & Southeastern. The Wisconsin Central some months ago amended its articles of incorporation to allow it to take over both of these subsidiary companies. A mortgage was made on these lines built, and to be built, securing an issue of $7,000,000 first mortgage, 30-year, 4 per cent. bonds, whose sale furnished funds for retiring the issue of $5,000,000 five-year 4½ per cent. notes dated July 1, 1905, and for paying other debts incurred in the building of the Duluth extension. The parent company is also to pay, from its surplus, $1,000,000 of the cost of the new lines. The $8,000,000 thus accounted for covers the estimated cost of the line and terminals.

A month ago it was announced that the Wisconsin Central stock held by Edward Sweet & Co.; Maitland, Coppell & Co.; Brown Brothers, and James B. Colgate & Co. had been sold to interests represented by W. A. Bradford, President of the Chicago, Cincinnati & Louisville, and associates. W. L. Bull, chairman of the board, resigned and was succeeded by George M. Cummings, chairman of a protective committee of preferred stockholders. The preferred stock is entitled to 4 per cent. dividends with the provision that if such dividend is not paid for two successive years after July 1, 1904, the preferred stockholders have the right to elect a majority of the directors. It is supposed that the change in control was an outcome of this condition, since no dividend has been yet paid on this stock. Following the change in control, Mr. Bradford was made President, succeeding H. F. Whitcomb, and a new board of directors was elected. It is interesting to notice that the Chicago, Cincinnati & Louisville, of which Mr. Bradford remains President, recently made arrangements with the Illinois Central for an entrance into Chicago, giving it connection with the Wisconsin Central.

The gross earnings of the company for the year ended June 30, 1906, were $7,120,000, which compares with $6,650,000 in 1905. A great part of the tonnage of the road is in iron ore, and the tremendous demand for iron and steel during the last year has been the prime factor in this increase in earnings. Operating expenses were $4,540,000, a small increase in proportion to the increase in gross earnings, the expenses in 1905 having been $4,370,000. The largest increase under this head was in conducting transportation, which rose 6 per cent. Maintenance of way and general expenses cost slightly less than last year, while maintenance of equipment increased 4 per cent. While the maintenance charges are low, it is



Wisconsin Central.

to be remembered that the freight density on this road is less than on other competing lines in its territory.

The principal statistics of operation are as follows:

	1906.	1905.
Mileage worked	977	977
Freight earnings	$5,317,237	$4,936,220
Passenger earnings	1,481,175	1,405,126
Gross earnings	7,118,576	6,650,884
Maint. way and structures	859,723	866,203
Maint. of equipment	805,666	776,650
Conducting transportation	2,618,434	2,466,141
Operating expenses	4,542,477	4,374,336
Net earnings	2,576,100	2,276,547
Net income	802,188	555,844
Year's surplus.	363,517	66,597

NEW PUBLICATIONS.

Report of the Electric Railway Test Commission to the President of the Louisiana Purchase Exposition. J. G. White, Geo. F. McCulloch, James H. McGraw, H. H. Vreeland, W. J. Wilgus, Commissioners. New York: McGraw Publishing Co. 621 pages; 212 illustrations; 6 in. x 9½ in. Price, $6.00.

This is a report of the work done under the Electric Railway Test Commission at the St. Louis Exposition, and forms about the most comprehensive collection of data that has thus far been brought together. The tests were of five kinds: Service, acceleration, brake, alternating current losses and train resistance. The results should be of great value to street railway managers, both in their choice of equipment and for operation. The report, unfortunately, is not as well fitted to practical use as it should be. A concluding chapter giving a general summary and comparison of the results should have been added. There is a discussion of the results at the end of each chapter, but this is not always clear. With these exceptions the report is admirably complete.

The tests of single-truck and double-truck cars showed that the average watt-hours per ton mile are 162 for a single-truck car and 122 for the double-truck car. While the average per car-mile was not much less for the single-truck car, the weight of this car was little more than two-thirds that of the double-truck car. It would appear that, of the two, the operation of the double-truck car is far more economical.

The brake tests confirmed the already known fact that a higher

average schedule speed can be maintained by using the air-brake than where the hand brake is used. The difference is about 7 per cent. The additional expenditure of power is saved by the greater time during which a car can be allowed to drift after shutting off the current before applying the brakes, because the application of the air-brake takes less time. It is to be regretted that the tests did not include a measurement of this interval, which would have made a valuable addition to the data already existing on this subject.

Another point of great importance that has been settled is the effect of the form of the front end or vestibule on train resistance. End resistances at different speeds were taken with floating vestibules that were flat, in the form of a paraboia, of a parabolic wedge and of the standard curved form. As would be expected, the flat vestibule made the greatest resistance at speeds of from 40 to 60 miles an hour. At 60 miles an hour, this resistance was from 20 to 40 per cent. greater than when the other forms were used. Below 40 miles an hour there is not much difference. It appears also that the form of the rear of the car has an important influence, and what is best for the front is not necessarily the best for the rear. These instances are cited to show how thoroughly the work was done and of what practical benefit in a saving of dollars and cents in railroad operation the data may be to officials who will but take the time to study and make the most of the information set forth in this report.

CONTRIBUTIONS

The Marshall Valve Gear.

Louisville, Ky., Oct. 29, 1906.

TO THE EDITOR OF THE RAILROAD GAZETTE:

At the last convention of the American Railway Master Mechanics' Association a paper was presented by Mr. C. J. Mellin on Special Valve Gears for Locomotives in which reference was made to the Hackworth valve gear, and to the fact that in the case of the Hackworth gear the vertical displacement of the axle in the pedestal jaw affects the steam distribution. Two motion diagrams of the Marshall valve gear (a modification of the Hackworth gear) worked out by the writer and reproduced in the *Railroad Gazette* May 29, 1903, give a clear idea of the kinematic features of that year. The accompanying drawings show an adaptation of the Marshall valve gear to locomotives wherein the disturbing effect on the

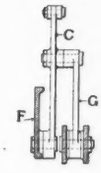


Fig. 2.

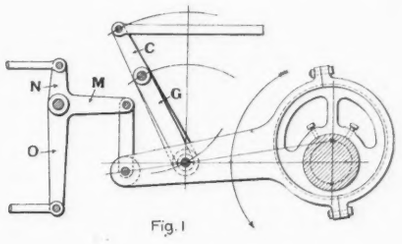


Fig. 1

Fig. 3.

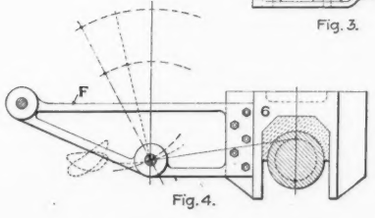


Fig. 4.

lead and cut-off, due to the vertical displacement of the axle, is obviated. It will be seen that the principal parts of the motion gear are carried by the beam F, which is bolted to the driving box 6. This arrangement causes the whole gear to rise or fall in unison. Flat valves may be driven through the arm N of the valve-operating bell-crank M N O, or a piston valve of the inside admission type can be driven through the arm O of the bell crank. Figure 2 is a transverse view of the supporting beam, the arm C for sustaining the guiding link G. Fig. 3 is a plan of the eccentric rod or combination lever.

It is the belief of the writer that proportions can be assigned to the Marshall valve gear, for application to different types of locomotives, that will give as satisfactory steam distribution as the Stephenson link motion or the Walschaert valve gear under all conditions.

HARRY CORNELL.

Specifications for Direct Current Relays.*

1. Type.—All relays must be of the enclosed type with all working parts enclosed in a transparent case.

All relays should be sufficiently water-tight to stand a water immersion test of at least 10 minutes.

2. Material and Workmanship.—Magnet cores and armatures shall be made of the best quality of soft annealed iron, and all other materials used in the construction of relays shall be of good quality, free from defects; workmanship and finish shall be satisfactory to purchaser.

3. Armature Supports.—Armature supports must be securely mounted on the magnet cores, or the armature supports and cores may be mounted on the same piece of metal, in such manner that the same relative position of armature and cores faces will always be maintained.

Trunnions of armature bearings shall be hard drawn German silver, shall be cylindrical and at least $^1/_{16}$ in. in diameter.

Trunnion screws must fit tightly in their supports and be provided with jamb nuts.

4. Armature.—Armatures shall be parallel with face of cores when relay is energized. Springs, adjustable stops or other means of adjusting armature vertically will not be permitted.

A minimum air gap of $^1/_{64}$ in. between armature and magnet cores shall be insured by bone or brass pins driven in end of cores or in armature.

Stop pins must be driven firmly to the bottom of the holes drilled for their reception and secured by cupping.

5. Contact Springs.—Contact springs or fingers shall be mounted rigidly on the armature not less than $^3/_8$ in. from nearest face of same and shall be sufficiently heavy to retain any adjustment they are given.

6. Contact Points.—All contact points shall make sliding contact.

Stationary front contact points of track relays shall be of non-fusible materials and back contact points shall be of platinum.

A closed contact shall not have more than 0.13 ohms resistance.

All contacts shall have a minimum opening of $^1/_{16}$ in.

7. Magnet Coils.—All magnet coils must be form wound and convenient of application to core; all insulation shall be applied before coils are assembled on cores and when assembled they must be securely held to prevent vibration.

The wire for magnet coils shall be soft drawn copper covered with a good quality of silk or cotton braid or equally good insulation and of proper size to give resistance specified.

The ends of wires connecting magnets shall be soldered, non-corrosive flux being used.

Terminal wires of magnet coils shall not be less than No. 20 B. & S. gage.

Magnet coils shall be encased to prevent mechanical injury to wire.

8. Binding Posts.—Binding posts shall be of brass of such cross section that they will not turn in the base or frame on which they are carried. The stud carrying thumb screws for fastening wires shall not be smaller than 10-32.

9. Insulation.—An air gap of not less than $^3/_8$ of an in., or approved insulation equivalent thereto shall be provided between any part of the relay carrying current and any other part thereof. Parts so insulated shall withstand a test with an alternating current of 3,000 volts for one minute.

10. Resistance.—All track relays shall be of 4 ohms resistance, unless otherwise specified.

11. Adjustment of Relays. Track 4 ohm.—Four ohm track relays shall be adjusted to release at not less than 30 mil-amperes after an initial charge of 110 mil-amperes has been given for one minute.

After relay has been adjusted to release as specified, the current through coils shall be reversed when armature shall pick up at not more than 65 mil-amperes.

Sixteen ohm.—Sixteen ohm track relays shall be adjusted to release at not less than 14 mil-amperes after an initial charge of 55 mil-amperes has been given for one minute.

After relay has been adjusted to release as specified, the current through coils shall be reversed, when armature shall pick up at not more than 36 mil-amperes.

All Track Relays.—If after a relay has been adjusted as specified, the front contact points are adjusted so they do not make contact when relay is energized, the initial charge is applied and gradually reduced to 40 per cent. of normal release current, the armature shall release.

12. Adjustment of Relays—Line Relays.—Relays shall be adjusted so armatures will pick up and give good sliding contact as follows: One hundred ohms at not more than 1.7 volts; 250 ohms at not more than 2.6 volts; 500 ohms at not more than 3.6 volts; 750 ohms at not more than 4.4 volts; 1,000 ohms at not more than 5.0 volts.

*Committee Report, Railway Signal Association, Washington meeting.

After being adjusted as specified the voltage required to pick up the armature shall be increased 100 per cent. and then gradually decreased by means of a variable resistance, and armature shall release when voltage is reduced to 40 per cent. of the voltage required to pick up same.

All Line Relays.—If after relay has been adjusted as specified the front contact points are adjusted so they do not make contact when relay is energized, and the voltage required to pick up armature increased 100 per cent. is applied and gradually reduced, relay shall release at not less than 16 per cent. of the pick up voltage.

13. Residual Magnetism.—Before adjusting all relays of less than 100 ohms resistance must be subjected to a momentary e.m.f. of not less than 40 volts, and all relays of more than 100 ohms resistance must be subjected to a momentary e.m.f. of not less than 100 volts nor over 500 volts.

14. Sealing and Marking.—All relays must be sealed with the manufacturer's seal, and all adjustments marked plainly in the sealed portion of the relay.

15. Test After Assembling.—All tests are to be repeated after relay has been assembled and sealed.

Addendum.

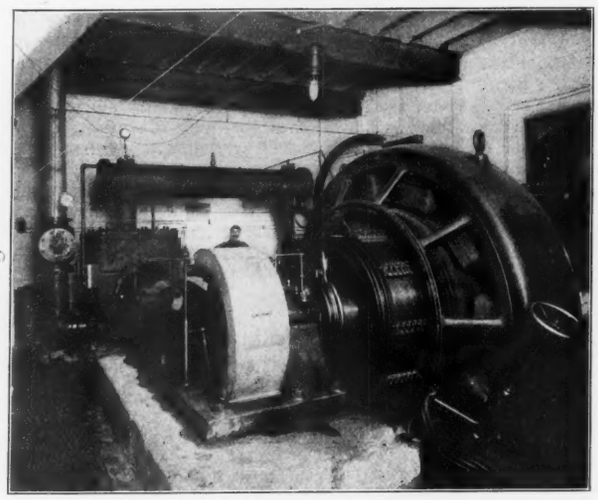
The Union Switch & Signal Company, the General Railway Signal Company, the Hall Signal Company, and the Federal Signal Company have recently agreed upon a standard set of symbols to be used in making drawings of signal circuits, etc., which agree with but contain a larger number of symbols than the Association has adopted to date. It is recommended by the committee in the interest of promoting standards and in view of the beneficial results which may be expected if all railroad and signal companies used the same symbols, that the additional symbols appearing in the signal companies' standard list be adopted by the Association and added to those in present use.

L. R. Clausen, Chairman, C., M. & St. P.; W. A. D. Short, Ill. Central; V. I. Smart, C. & E.; C. E. Denney, L. S. & M. S.; E. A. Everett, M. C., Committee.

The Pennsylvania Tunnels Across Manhattan Island.

The principal features of the Pennsylvania tunnels under the North and East rivers and Manhattan Island were illustrated and described in the *Railroad Gazette*, Oct. 9 and 16, 1903. In the issues of July 6 and 27, 1906, the method of driving the sub-aqueous tunnels under the East river and the contractor's plant were the subjects of two articles. Through the courtesy of the Pennsylvania, New York & Long Island and the United Engineering & Contracting Co., contractors for the work, we are now permitted to describe the methods and plant used in driving the tunnels under 32d and 33d streets from the shaft at First avenue to the terminal station at Seventh avenue about one mile. A double track tunnel is being driven through rock under both streets without disturbing the surface.

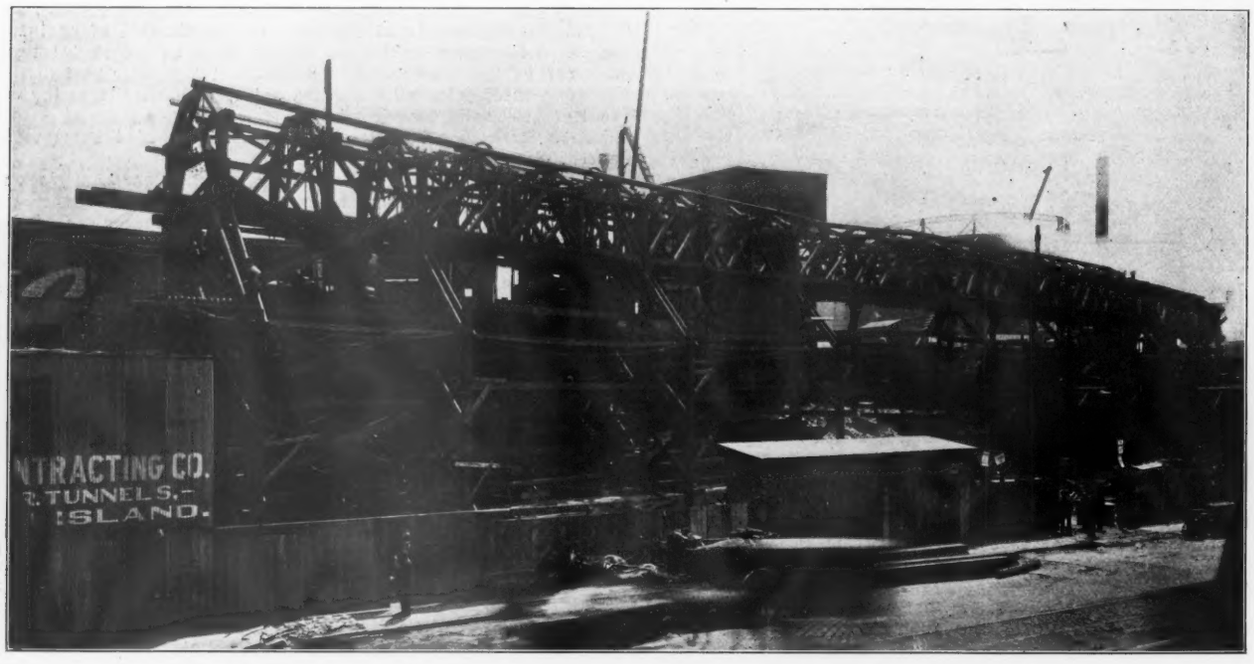
The river tunnels emerge into the two shafts just east of First avenue. These shafts are 63 ft. 3 in. x 32 ft. and are divided by a temporary longitudinal wall of reinforced concrete extending up about half-way to the surface. The west half of each shaft is used by the United Engineering & Contracting Co. and the east half by S. Pierson & Sons, the contractors for the river tunnels. The two lines running under 33d street are designated as A and B and the two under 32d street as C and D. The two lines in each tunnel leave the shafts in separate tunnels, 34 ft. 3 in. center to center and separated by a rock wall 12 ft. thick. They continue west on a 1 deg. 30 min. curve until they strike the tangents under the two cross streets at Second avenue. They converge west of First avenue



Motor-Driven Air Compressor at River Shaft.

into parallel twin tunnels separated by a concrete dividing wall. One of the drawings shows the standard twin tunnel section. From the shafts to a point under Fifth avenue the four lines rise on a uniform 1.5 per cent. grade. At this point the twin tunnels widen out into a single arch three-track tunnel, which continues on to the station on a 0.5 per cent. rising grade. The second drawing shows this section. The crown of the twin tunnels is at average depth of about 60 ft. below the street surface, but for the three-track tunnels this diminishes to from 25 ft. to 35 ft. The rock is mica schist and hard gneiss and is of good quality for most of the distance.

Work was begun by the contractors in July, 1905. The railroad company bought a lot on the north side of 33d street, near Fourth avenue, and another lot on the north side of 32d street between Fourth and Madison avenues for the use of the contractor in sinking shafts and erecting a working plant. Space was also provided at the river shafts. A shaft about 20 ft. x 30 ft. was sunk on each



Telpher Runway at River Shafts; Pennsylvania Railroad Tunnels Under Manhattan Island.

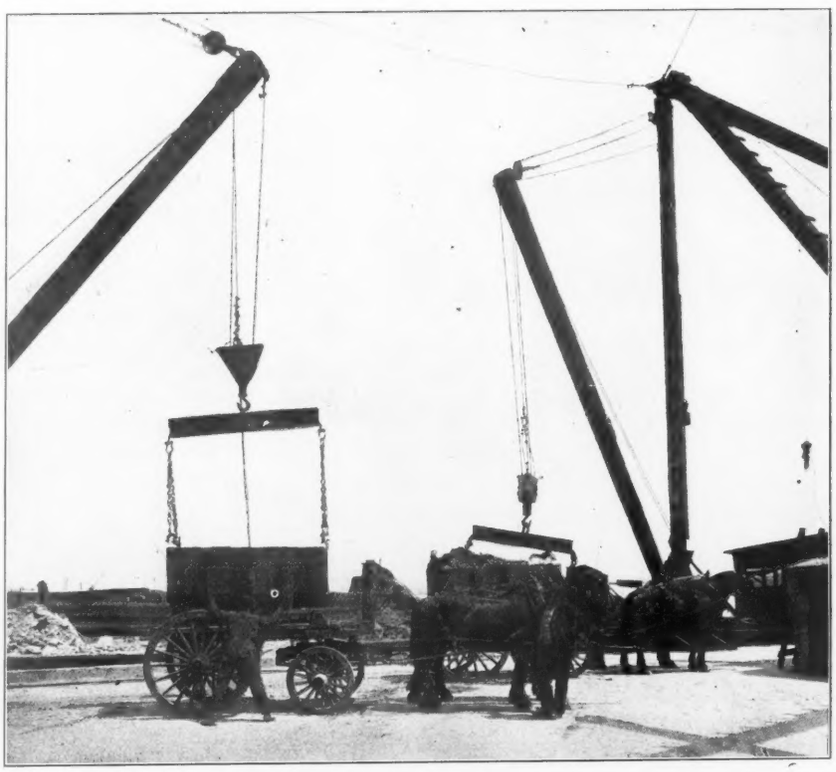
Electric Locomotives at Foot of Fourth Avenue Shaft; Pennsylvania Railroad Tunnels Under Manhattan Island.

After a Blast, Showing Two Headings; Pennsylvania Railroad Tunnels Under Manhattan Island.

of these two sites to the level of the tunnels and cross drifts excavated into the south wall of the tunnels. A sump 10 ft. below the tunnel floor was provided at the bottom of the shafts for draining the workings of surface water. At the river shafts the tunnels were begun in the solid rock, the caissons not having been sunk to the level of the tunnels. Excavation has since been going on continuously, the headings being driven in both directions from the Fourth avenue shafts.

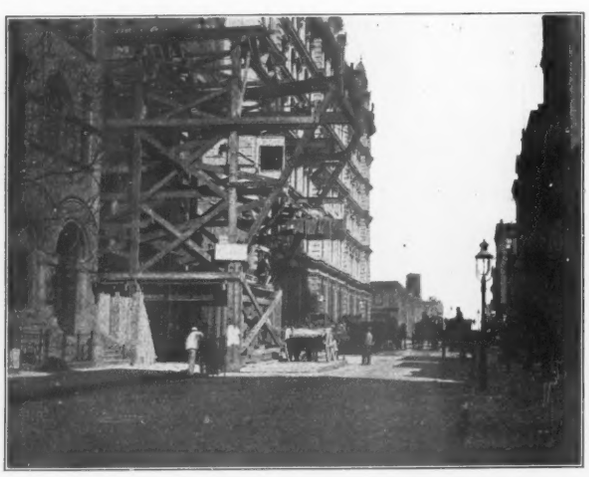
The working plant installed by the United Engineering & Contracting Co. was designed to meet the peculiar conditions existing. West of Fourth avenue the tunnels will pass under a section of the city occupied by heavy and expensive buildings and carrying an enormous traffic on the streets. Real estate values are high and only a limited space was available for the shafts and working plant. It was essential to avoid as much as possible noise, dirt and concussion from blasting. How well this has been done is shown by the few complaints made, although the 33d street shaft is immediately adjoining a large private hospital and across the street from one of the well-known hotels. The 33d street tunnel was driven under the subway station at 33d street and Fourth avenue without loosening a tile in the station walls, although the roof of the tunnel is only 35 ft. below the subway floor. Electricity has been employed throughout in the above ground plant and compressed air from electrically driven compressors for all operations below ground except haulage. Except for the smith's forges in the repair shop not a pound of coal has been burned on the job. Direct current at 230 volts is supplied by the New York Edison Co.

Two compressor plants have been installed, one at 34th street and First avenue for supplying the headings opening from the river shafts and one in the rear of the 33d street shaft near Fourth avenue. The plant at the river shaft contains one Laidlaw-Dunn-Gordon, two-stage compressor with cylinders 32 in. and 20 in. x 30 in. stroke, direct connected to a 480 h.p. Ft. Wayne motor. This compressor will deliver 2,870 cu. ft. of free air per minute at 100 lbs. pressure when running at 100 r.p.m. It was found that this machine could not supply enough air for both headings and two smaller belt-driven compressors were installed. One has a capacity of 650 cut. ft. of free air per minute, and is driven by a 200-h.p. General Electric motor. The other has a capacity of 1,250 cu. ft. per minute, and is driven by two 200-h.p. G. E. motors placed in direct line with both belts running over the one fly-wheel of the compressor. This arrangement was adopted because of the difficulty in getting delivery of a single motor of the power required. These small compressors are also two-stage, Laidlaw-Dunn-Gordon machines. All three compressors discharge through an aftercooler into a large storage tank from which an 8-in. main leads to the shafts, where it divides into two 6-in. mains leading into the two tunnel headings. The water for the aftercooler is cooled in a Barnard cooling tower, through which circulation is maintained by a small direct driven Worthington centrifugal pump. A motor-driven blower also provides for additional circulation of pure air in the tunnels through a 14-in. riveted steel pipe which extends up to the headings. At the river shafts are also a forge shop, machine shop, oil house, sand house for filling tamping bags, powder magazines and carpenter shop.



Loading and Unloading Skips at the Dock.

The 33d street compressor plant contains two compressors similar in every respect to the large unit at the river plant. These machines are governed by throttling the intake. They are on concrete foundations resting on solid rock and run with little noise or vibration. They supply air to both the 33d street and 32d street tunnels, a 6-in. main being carried over to the other shaft. A blower is also installed for ventilation.

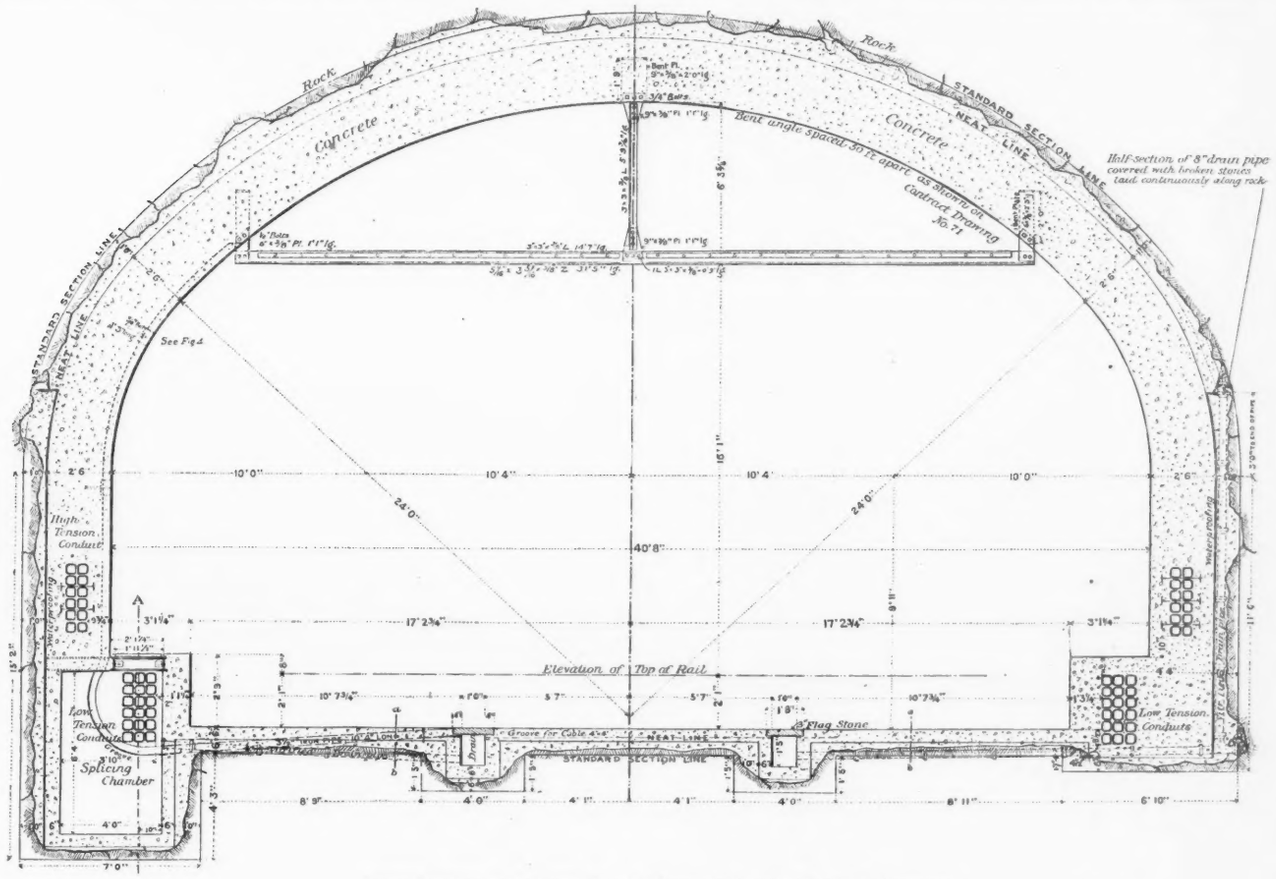


Lowering a Skip to Wagon at 32d Street Shaft.

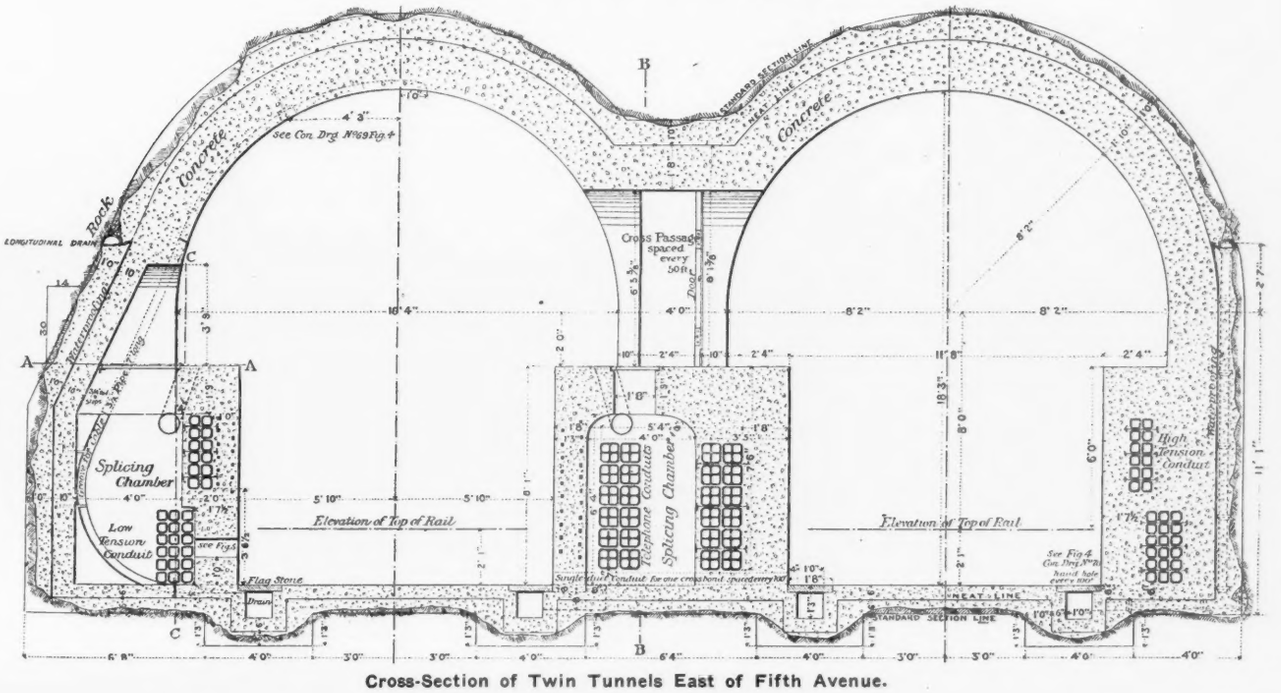
Dumping a Skip over the Scow.

The plant below ground is equally novel. Up to the present time the tunnels each way from the Fourth avenue shafts have been driven with two headings near the crown. These headings are kept a short distance in advance of the bench excavation, and the wall between them is shot out as the work progresses. Owing to the good quality of rock encountered no timbering has been required so far in the 33d street tunnel, but in the west end of the 32d street

tunnel supports are being put in at frequent intervals to prevent falls. The process of drilling, blasting and mucking is carried on alternately at the two headings of each tunnel. After the day's blasting has been finished in the afternoon the drills are put to work immediately and mucking begun at the same time. For this a Marion No. 20, 35-ton, 1½-yd. steam shovel is employed. This shovel is a standard machine with special rock dipper, but the boiler is used as an air receiver and is connected by a flexible hose with the compressor line supplying the drills. It runs on a 3-ft. gage track in the center of the tunnels and has sufficient swing to reach both side walls. A gang of 15 or 20 laborers clears out the headings and the shovel loads from the pile of loose rock into 90 cu. ft. skips on trucks standing on a track between the shovel and the wall. This track has a descending grade away from the heading, and after a skip is loaded the truck is given a push by the shovel bucket and runs back to a siding where trains of four cars are made up. An empty skip is hauled up to the shovel by a cable running up to the shovel around a sheave and then back to a small hoisting engine mounted on a flat car and operated by compressed air. When four cars are loaded they are hauled back by electric mine locomotives to



Cross-Section of Three Track Tunnels West of Fifth Avenue.



Cross-Section of Twin Tunnels East of Fifth Avenue.

the cross drift and in under the shaft to be raised to the surface. These locomotives, which were made by the General Electric Co., weigh 10 tons and have a drawbar pull of 3,500 lbs. They have two 40-h.p. motors and have a speed of six miles an hour. Current is transmitted from two trolley wires suspended from the top of the tunnel by a traveling trolley carriage, which is connected to the locomotive by a cable carried on a reel. This reel may be made to automatically wind or unwind when desired, so that the locomotives can be run beyond the trolley wires which are not carried up close to the headings on account of the danger when blasting.

After mucking is finished at one end of the tunnel the shovel is turned and run to the other end, where the blasting has just been finished. It requires about 24 hours to drill, blast and muck each end.

The loaded skips are pushed under the bottom of the shaft two at a time on parallel tracks and are hoisted by electric telpher hoists to the level of a platform about 12 ft. above the street. The telphers, which were designed and built by the Dodge Coal Storage Co., Philadelphia, are suspended from an overhead single track which is carried on a substantial wooden trestle. They have two carriages, one supporting the hoisting heave and the other carrying most of the weight of the hanging cab and also the traversing motor. These telphers run on parallel tracks from over the shaft to the curb line of the street. The loaded buckets are lifted, carried out and lowered on to trucks in the street below. They are carted through the streets to the company's dock at the foot of East 35th street, where they are dumped into scows. There is no noise and no dirt at the shafts and the operation is carried on day and night without disturbing the neighborhood. There is a down grade all the way to the river, so that a two-horse team has no difficulty in hauling a loaded skip except in winter when heavy snow is on the ground. It is a haul of about half a mile to the dock from the Fourth avenue shafts and about two blocks from the river shafts.

At the dock the buckets are lifted from the trucks, swung out over the scows moored alongside and dumped automatically. This is done with two 40-h.p. electrically driven Lambert hoists. A third hoist of 60 h.p. is used for unloading materials from scows. The skips are made of steel in two halves with hoisting eyes for attaching a spreader beam at the center of the ends. No latches are required to hold the skip shut when hoisting. To dump the skip a tripping rope is used, passing down from the boom point sheave and made with a sling attached to the bottom of the sides. This tripping rope passes around a loose drum on the hoisting engine and is provided with a counter-weight to take up all slack. By checking the tripping rope drum and lowering the fall block about 2 ft. the entire contents of the bucket can be dumped at any desired height over the scow. When the tripping rope is slacked off the bucket closes by gravity and is swung back on the waiting truck to be returned to the shaft. About 50 teams are employed day and night between the shafts and the dock. The railroad company furnishes the empty scows and removes the loaded ones to Greenville, N. J., in New York Bay, where the rock is being used for filling in the new terminal freight yards.

At the present time the tunnel under 33d street has been excavated west from the river shaft to a point between Second and Third avenues, east from the Fourth avenue shaft to a point between Lexington and Third avenues and west to a point west of Fifth avenue. The 32d street tunnel has been driven west from the river shaft to a point between Second and Third avenues, east from the Fourth avenue shaft to a point near Lexington avenue and west to a point between Madison and Fourth avenues.

We are indebted to Mr. D. L. Hough, President of the United Engineering & Contracting Co., for information and to Mr. George Perrine and the New York Edison Co. for the photographs.

American Railway Association.

The fall session of this Association was held at Chicago, October 24, 220 delegates being present, representing 94 railroads. The membership of the Association now comprises 317 companies, operating 227,462 miles; associate membership, 32 members, 997 miles.

The Association authorized the president to appoint a special committee of nine members to consider the question of the Standard Location for Third-Rail Working Electric Conductors.

The Committee on Train Rules, with the Committee on Safety Appliances, proposes to revise the Standard Code of Block Signal and Interlocking Rules. The Committee on Safety Appliances has made considerable progress in the formulation of a Standard Code of Air Brake and Train Air Signal Rules. Of the 1,861,129 freight cars reported to this committee 92 per cent. are fitted with air brakes.

The Committee on Statistical Inquiry has again revised the form of report for "Railway Transportation Statistics" previously approved, and also some of the directions for compiling the different items, but the report was presented only for discussion, and at the request of the committee it was referred back. Under the provisions of the revised Interstate Commerce Law the committee is confronted with the fact that Congress has authorized the Interstate Commerce Commission to prescribe the forms of any and all accounts, records and memoranda of the movement of traffic; but an informal conference has been had with Professor Adams, the statistician of the Commission, and he says that no drastic regulation is likely to be prescribed. Nevertheless, the committee has laid aside considerable work that it has had in hand until such time as the policy of the Interstate Commerce Commission on this subject has been officially announced. The committee is convinced that while forms of statistics may be recommended for adoption, they should be made sufficiently elastic to be adapted to the requirements of roads operated under widely different conditions and open to the freest amendment. An absolute prescription of the forms would be positively injurious. Improvements in statistical forms must be made as the result of actual experiment, in order to be practically valuable.

The Association formally adopted the Standard Cipher Code which has been compiled, and a resolution was adopted recommending that it be used exclusively by all members of the Association for non-secret cipher messages after January 1, 1907.

The Committee on Transportation of Explosives presented a report in which were embodied the various interpretations which have been rendered in connection with the Regulation for the Transportation of Explosives. A list of roads which have adopted the Regulations also accompanied the report. The committee announced that a meeting of the railroads which have subscribed to the Articles of Association of the Bureau of Explosives would be held in New York City November 21.

The Committee on Standard Rail and Wheel Sections recommended, and the Association approved, an increase of 1/8 in. in the thickness of the flange in cast-iron wheels in accordance with the action of the Master Car Builders' Association. The committee was instructed to consider standard specifications for the manufacture of rails, in addition to the other questions which it has in hand.

The Committee on Car Service reported its doings in regard to the formulation of a diversion rule, to be effective "only in cases where cars are delivered to specified foreign roads contrary to the expressed wish of the car owners." The committee has given much time and thought to the consideration of the question of an accurate definition of "diversion" and to the penalty that should be imposed, but finds that wide differences of opinion exist among the members of the Association. It also reports having found a strong sentiment in favor of a further increase in the per diem rate, especially on cars of high capacity. The committee deprecated too frequent alterations of the per diem rate. The present rate of 25 cents a day did not take effect until July 1 of the present year, and has been in operation but a few months, not long enough to judge of its effect. The committee recommended that no further change in the rate should be made until after July 1, 1907, when the present rate shall have been one year in effect. The committee proposed alternative rules for a diversion penalty not being able to agree unanimously on any form; but neither was approved, and the report was referred back. Neither was there agreement concerning an increase in the per diem rate, and the letter ballot which is to be taken will offer two propositions, one for 50 cents a day and one for 75 cents. In short, the convention appears to have been too excited to effectively discuss the subject of per diem calmly. A committee of five is to be appointed by the president to consider the subject of a freight car pool, and this committee will very likely endeavor to crystallize the views of the members on the whole subject of car hire and the treatment of foreign cars. The appointment of this committee was the result of a proposition by President Fish, of the Illinois Central, to consider the question of a clearing house. The resolution reads:

Resolved, That a special committee of five be appointed by the president to inquire into and report upon the causes of car shortage and the lessening efficiency of equipment, and to recommend remedies, the committee to be authorized to employ such assistance as may be necessary, and that a special assessment of 10 cents per mile operated be levied to meet its expenses, payable Decembr 1, 1906.

Resolved, That the communication from Mr. Fish be referred to this special committee, with instructions to consider the formation of a plan under which railroads desiring to pool their freight cars can form a clearing house which will assure to each road at all times the use of a number of cars equivalent to those contributed by it.

Mr. Daniel Willard, Second Vice-President of the Chicago, Burlington & Quincy, was elected First Vice-President. The following railroads were elected members of the Committee on Car Service: Boston & Maine, Chicago, Milwaukee & St. Paul and Delaware, Lackawanna & Western.

The following railroads were elected members of the Committee on Safety Appliances: Chicago & North-Western, Cleveland, Cincinnati, Chicago & St. Louis and Philadelphia & Reading.

The next meeting of the Association will be held at Chicago, April 24, 1907.

Annual Meeting of Railway Signal Association.

Three of the committee reports presented at the annual meeting of the Railway Signal Association in Washington, October 16, 17 and 18 were published in the *Railroad Gazette* of October 19* and a fourth report, together with portraits of the new President and Secretary and the retiring President, were published last week. Following is an account of the discussions at the meeting, with abstracts of the remaining reports.

MECHANICAL INTERLOCKING.

At the opening session, Tuesday morning, about 100 members were present. President C. H. Morrison (Erie) presided and the secretary of the association, H. S. Balliet, was secretary of the meeting. Mr. Morrison, in his opening address, spoke of the important work which has been done by the association and the need of enterprise and energy in taking up a wider range of work for the future. The first business done was to amend the constitution so as to permit active members who leave the railroad service to retain their membership if they do not engage in the manufacture or sale of railway appliances or materials. The first report was that of the committee on standard specifications for mechanical interlocking, which presented a revised code embracing numerous paragraphs different from those in the specifications heretofore approved. The meeting took up the report one paragraph at a time and a large number of points were discussed, some of the criticisms resulting in votes approving corrections, but after an hour or two spent in this way some one recalled the stipulation of the constitution that propositions to adopt standard practice or recommendations must be voted on without amendment, and only by senior members, the votes of two-thirds of the seniors present being required to carry any point. But on the declaration of a prominent member that as "between frinds" a constitution should not count, the meeting enthusiastically approved the whole code, as amended. Following are the more important amendments approved:

Article 3, last line, add "and provide space for all connections."
Article 27, last line, each *spare* lever space.
Article 39, second paragraph, 8 feet, change to 6 feet.
Article 48, *high* home signals.
Article 49, rivets for pipe plugs to be $1^{11}/_{16}$ inches long.
Article 50, 5 feet from gage line of nearest rail. Cut out reference to long ties.
Article 52, expunged.
Article 128, 6½ inches or 8⅝ inches diameter.
Article 144, 6 feet from gage line of nearest rail.
Article 158, 2 inches diameter over all.
Article 172, concrete *not less than* 3 x 3 x 3.
Article 173, same change.
Article 174, cut out first eight words, and read: "Iron piers shall be set," etc.
Article 210, two coats of black paint.
Article 219, all wooden boxing shall be painted two coats,, etc.

SPECIFICATIONS FOR ELECTRIC INTERLOCKING.

The meeting next took up seriatim the standard specifications for all-electric interlocking. These were discussed in the same way as the others until it became evident that the subject would take up an inordinate amount of time, when, at Article 27, the report was referred back to the committee. In this report Article 3 was changed to have a blank in place of "signal engineer" and Articles 6 and 25 were changed in the same way. In Article 11 the requirement to furnish stroke completers was cut out. In Article 13 the last sentence was cut out. Article 17 was cut out entirely.

STORAGE BATTERIES.

The report on installation and maintenance of storage batteries (which was printed in the *Railroad Gazette* October 19) was accepted as a progress report after but little discussion. This report proved in the main acceptable, but the recommendations were held applicable only to batteries of low voltages.

A NEW SYSTEM OF SIGNALING.

Following this the committee took up committee report H. This report, made by a committee of members who are members of the Signal Committee of the American Railway Engineering & Maintenance of Way Association† sets forth "a complete system of signaling for proper handling of traffic." The report was printed last week. It was not formally accepted, and is likely to be amended both in form and substance, the meeting having referred it back to the committee. It is of interest, however, as a radical departure from present practice in a number of features. In most of its recommendations the committee report agrees with a report made some months ago to the general managers of the Pennsylvania Railroad Lines both east and west of Pittsburg, by Messrs. A. H. Rudd and Frank Rhea, and Mr. Rudd was the chief spokesman for the committee. The illustrations given in the *Railroad Gazette* have been corrected, those shown with the report as issued by the association having been in some respects inaccurate. Those on the two pages of the pamphlet following diagram No. 2 were printed by mistake and have no connection with the report. The diagrams headed "suggestions" are not touched upon in the report itself and the discussion ended before they had been reached.

The principle that a semaphore should give its indication in the upper right-hand quadrant was approved by the association a year ago, though the three-position principle was not then voted on. This being so, the first important point taken up was the matter of two lights (second recommendation, paragraph d). This principle was perhaps more seriously criticised than any other. The use of a second light where there is no diverging track, and where the light has to be constantly red, is regarded by many as an unnecessary expense, besides making one more red light to disturb runners of fast trains. It was stated, on behalf of the committee, that the views expressed in this report had received the decided approval of a good number of officers, some of them high officers, of the Pennsylvania Lines. In reply to the question how it would be possible to secure the approval of men who deem it highly important to relieve runners of fast trains of every possible red light, it was said that that idea was impracticable. Those who try to get rid of all red lights always fail in practice, though they stick to their theory. Runners of fast trains are encountering red lights constantly at interlockings and it is futile to try to do away with the alleged disadvantage. The main object in making the two-light arrangement uniform is to make it easier for enginemen to quickly identify signals. On the Delaware, Lackawanna & Western, when its signaling plans were revised about six years ago, the lower light on the high posts at diverging junctions was arranged to be obscured when the arm was horizontal, and that plan was followed for some time, but it proved unsatisfactory, as, in some cases under peculiar circumstances, enginemen not sufficiently vigilant would go through the junction at too high speed. If lights were always perfect the committee would not have felt warranted in recommending the two-light arrangement. The most common cause of light failures is inadequate or unskilful attendance and this is a difficulty sometimes hard to remedy. The committee believes that the cost of the additional light and its maintenance (with long-time burners) is very small compared with the added safety.

Mr. Rhea, in giving his experience with enginemen who run under the three-position automatic block signals on the Pennsylvania Lines west of Pittsburg, said that the runners liked the three-position idea in the daytime but not in the night; and, on analyzing their objections, he found that at night they wanted two lights, not because they made a better signal to read, but because the signal was easier to locate.

Mr. J. B. Stewart, General Superintendent of the Boston & Albany, being present, was invited to take part in the discussion. Mr. Stewart said that he approved the upward inclination of the semaphore arm and hoped it would prevail. A committee of the New York Central Lines had voted in favor of it sometime ago. Voicing the views of those who believe that the committee is unnecessarily multiplying signal indications, Mr. Stewart argued in favor of simplifying and reducing them. The engineman of a fast train must have the least possible variety. The Boston & Albany, on its semaphores, had formerly used lights in a vertical line, and in a horizontal line, but the arrangement was abandoned and single lights substituted, because it was believed that the position or shape-lights could not be distinguished far enough away for enginemen running at the very highest speeds. He thought that the additional light was not needed to make a signal more easily identified, especially in a country of diversified topography such as the Eastern states; on the prairies it might be all right. Mr. Stewart also asked why the committee had ignored disk signals. These are in extensive use in New England and if, by a committee report, they are outlawed, a railroad using them will suffer in its reputation, for the public will think it is not up with the best practice.

Mr. Rudd, replying to Mr. Stewart, declared that the committee had not multiplied indications at the expense of simplicity. He called attention to the fact that, contrary to the impression gained by some, the committee had provided no more indications for night signaling than for day signaling. Criticisms of the arrangement of lights in a diagonal line are based on a misapprehension. The runner never has to distinguish between lights arranged diagonally and lights arranged vertically until he gets very near to them. Many criticisms of signal lights are based on the assumption that no distant signal is provided—or, rather, the critics forget that, with the distant signal, the two lights on a signal—any kind of signal—do not need to be distinguished one from the other at a great distance. The distance between the two lights in the committee's report (6 feet) is the same as that now existing between home and distant arms. As to conditions in the East as compared with those in the West, the two lights are more necessary in the

*"Storage Batteries," Oct. 19, page 333. "Disturbances by Foreign Currents," Oct. 19, page 333. "Specifications for Rubber Insulated Wire," Oct. 19, page 334. "New Scheme of Signaling," Oct. 26, page 368. Editorial on "New Signaling Scheme," Oct. 26, page 350. Portraits of Officers, Oct. 26, page 358.

†Committee:

W. A. D. Short,	C. C. Anthony,	C. A. Dunham.	J. A. Peabody,
A. H. Rudd,	H. S. Balliet,	G. E. Ellis,	T. S. Stevens,
Azel Ames, Jr.	L.R. Clausen,	J. C. Mock,	H. H. Temple.

East as confusing outside lights are more common. To expect the engineman to depend on a big rock behind a barn, or Jenks's sprout lot, to keep his bearings is pretty poor signaling. Mr. Rudd described the installation of upwardly inclined semaphores recently put in service on the Pennsylvania Railroad and described in the *Railroad Gazette* of October 19.

The committee provides for the use of five colors: green, red, yellow, purple and lunar white. White is not used as a marker. As to disk signals, the scheme proposed by the committee is for new work. It does not conflict with present signals or practice and does not forbid the use of disks. No one denies that the disk has done magnificent service. A prominent superintendent has expressed his willingness to put in the upwardly inclined signals at one or many points on his road one at a time, mixing them in with signals of the present pattern.

Mr. Clausen: No railroad should suffer for continuing to use disk signals. They are too numerous and have too settled a reputation to be disturbed by any action of any association. If we can adopt nothing new without fully retaining everything that is old, how can we ever make progress? A second light does make a slight increase in cost, but the increase will be very gradual and the advantage of the new system is so great that the increased expense is justified.

Mr. Rhea, replying to a criticism of his advocacy of a rule forbidding permissive block signaling, explained that he referred only to practice under the telegraph block system. Discussing the indications recommended in the report he called attention to the fact that in the scheme there is no such thing as a distant signal.

Mr. Yocum (P. & R.): We use a few disk signals [several hundred miles] and we have no fault to find with the report on this score.

Mr. Peabody (C. & N. W.): We believe the disk is a first-class signal, and we have put enclosed disks in service this year on 300 miles of double track line.

Mr. Rudd, answering further questions, alluded to the advantage of being able to give a distant indication at every signal. Under present practice, where a station has a home and a starting signal and perhaps another stop signal between these two, enginemen will pass a distant signal which stands against them and then, finding the first home signal clear, will proceed, assuming that the starting signal will be clear also; and thus they have got into trouble. The proposed scheme provides against this by furnishing a distant indication for every signal of any grade. A clear distant indication never gives authority to proceed more than to the second signal beyond.

The first vote taken was on paragraph *c* of the second recommendation, but it failed to receive the ayes of two-thirds of the senior members present. A motion to accept the report only as a progress report was lost, indicating that the meeting was determined, if possible, to approve everything in the report which could be agreed to as genuine progress. To clear the air it was then moved that the association (having already approved the upward inclination) recommend the use for night signaling of green for clear and yellow for caution. This received the unanimous approval of the senior members voting (41). It was then voted, 37 to 2, that the association recommend that where the semaphore is used the indications be given in the right hand upper quadrant; horizontal for stop, 45 degrees for caution and 90 degrees (vertical) for clear.

The discussion of the details of the report proceeded only as far as paragraph *c* under the second recommendation. Paragraph *a* was amended to read on all *high* signals and the last eight words were disapproved. The word "clear" was changed to "proceed" so as to make the term conform to the usage of the American Railway Association, but the weight of opinion among the signal men appeared to be that "clear" is the better word. Paragraph *d* was amended to read two *standard* lights. This much done, the subject was laid on the table, and when it was again taken up the association unanimously adopted the following resolution, presented by Mr. Mock:

"Whereas, Certain fundamental principles contained in this report have received the approval of the Association, it is

"*Voted* that it is the sense of the Association that the submitted methods of displaying the signal indications have advantages over other methods now in general use. We therefore accept the balance as a progress report and refer it back to the committee with instructions to further develop the scheme, with the object of securing their unanimous report."

It may be said that the tone of the discussion was less conservative than would be indicated by this resolution, Mr. Mock's aim being evidently to fully satisfy the conservative view. He assumed, no doubt correctly, that the members present who were not fully convinced of the wisdom of the bold innovations presented by the committee had not sufficiently formulated their objections to give them adequate expression. The most pronounced objections which did find expression were those relating to disk signals, before referred to, and those based on the excessive cost and complication of the additional lights at night.

RUBBER INSULATED WIRE.

The next report taken up was that on specifications for rubber insulated wire, which was printed in the *Railroad Gazette* October 19. This report was adopted substantially as presented, but not until after a long discussion concerning the alleged severity of the requirements of the specifications. One of the changes made in the report since last year is the omission of the word "dry" before "mineral" in paragraph 2, thus admitting of the use of "dope." The views of the wire manufacturers were presented by four or five members connected with the makers, one of them saying that his claims were backed up by 12 out of the 14 firms making insulated wire. The two others appear to be the firms which are satisfied with the severest possible requirements. The principal points made by the 12 were, that if wire larger than No. 6 is to be furnished in lengths over 1,500 ft., the specifications ought to have a rule such that a market could be found for short lengths; that the insulation resistance test might just as well be far less severe; that multiple conductors ought to be excluded from the requirements of the specifications; that if the buyer comes to the factory and sees 30 per cent. Para rubber put in there is no need of a subsequent test to prove the fact.

The chairman of the committee replied to the last point that the specifications had to be prepared with a view to the needs of the small buyers who could not afford to send an inspector to the mill. The committee will probably prepare specifications for cables and stranded conductors, and negotiate with inspection bureaus with a view to arranging with one such bureau to inspect wire ordered under these specifications. It is hoped that a number of the more important railroads will agree on uniform specifications and arrange to jointly employ a bureau for the inspection of all wire ordered by such roads. One of the questions to be settled in this connection is that of making wire in dull seasons. If the wire is to be inspected when made, some authority must have control of it from that time until a buyer appears for it.

SIGNAL LAMPS AND OIL.

The next report taken up was that on signal lamps and oil for use in them. The chairman of this committee is Mr. C. C. Rosenberg. The committee says that the only satisfactory design of lamp is that with top draft ventilation. The interior construction should be such that the inflowing air shall not come directly over the chimney, as with the small size long-time burners it may extinguish the flame. The air should descend into the body of the lamp by means of a vertical perforated cylinder forming the side walls and an imperforate upper wall, the two being connected by an inclined cone. The air chamber thus formed should be divided into parts by the use of vertical wings. Another method is to have a solid cone, bell shaped, at the bottom with two perforated plates, the upper or smaller of the two to have circular perforations, the lower plate to have elongated perforations. By the use of either of the systems described, the air entering the top of lamp follows the outside of cone, passes through the perforations and diffuses, thus breaking a straight draft, strikes the inside of body of lamp which it follows, thereby preventing any condensation or sweating on the sides of lamp or lenses.

On one road having 4,030 lamps in use, 3,700 of these having long-time burners and 80 per cent. having bottom draft, the record for the year ending June 30, 1906, shows 492 failures, classed as follows:

Cause of failures.	No. reported.	Draft—Top.	Draft—Bottom.
Broken chimneys	56	9	47
Defective fittings	81	..	81
High wind	74	..	74
Light wind or smothered	260	..	260
Smoked chimneys	21	..	21
Total	492	9	483

Of the 81 failures due to defective fittings, 35 were due to leaky founts; these were made of tin and had been in service several years. The other items were defective burners, broken reflectors and poor wicks. In no case has a top draft lamp of either of the two designs mentioned been found to have flame blown out by high winds or has it failed to give a full flame if properly looked after.

The committee made tests of six samples of illuminating oil and recommended the following specifications:

SPECIFICATIONS FOR ILLUMINATING OIL.

Samples must not flash below a temperature of 110 degrees Fahr. in the "Elliot" closed cup, nor burn below 160 degrees Fahr., in the Tagliabue open cup when heated at the rate of 2 degrees per minute and flame applied every 2 degrees beginning at 100 degrees temperature.

Must be not less than 47.3 Baume, or .7896 specific gravity.

Must be strictly water white in color and remain perfectly clear and transparent when cooled to a temperature of zero and held there for 10 minutes. Oil must be perfectly neutral showing neither acid nor alkaline reaction.

A sample will be taken from each carload or part carload lot (either in bulk or in packages) and such sample shall be considered representative of the entire shipment.

All samples will be taken with a thief.

The oil must burn steadily and clearly in a suitable lamp, without smoking and with a minimum incrustation of the wick for a period of at least 100 hours.

Any sample failing to meet all the requirements of this specification will be condemned and the shipment represented by it will be returned to the manufacturer at his expense, he paying for freight both ways.

Sample No. 1 shows the flashing point at 109 degrees Fahr., and sample No. 6 shows a burning point at 150 degrees Fahr. While this is below the flashing and burning points recommended in the specifications, there were certain properties in these oils that make them acceptable and the committee in drawing up specifications had to be governed so as to prevent the acceptance of an oil at a lower test which would not meet the requirements. Members will, of course, use their own judgment in accepting oils at a lower rating than that recommended. Oils from some localities will give better results at a lower rating than oils from other localities at a higher rating.

As the question of successfully using the long-time burner is still a matter of doubt in the minds of some, the committee has followed this up for another year and states that there is no question but that these burners are a success both from an economical as well as from a practical standpoint. The lamps must be properly looked after and those responsible should see that they get the attention they require. The old method of putting "drill outs" to look after lamps never was a success and never will be.

The cost of running the 4,030 lamps referred to for one year was as follows:

Number of lamps	4,030
Number of gallons oil used	46,688
Number gallons oil used per lamp per annum	11.59
Cost per lamp per annum for maintenance	$7.64

This cost includes all labor, all repairs to lamps, and oil, wicks, etc.

There was little discussion on this report but a letter was read from Mr. C. K. Freeman protesting against the action of the committee in recommending only two forms of lamp, both of which, said Mr. Freeman, were controlled by patents owned by a single company. The specifications for oil were adopted unanimously, but the rest of the report was recommitted with the request that the committee investigate farther.

TROUBLES FROM FOREIGN CURRENTS.

The report of the committee on how to remedy the effects of foreign current on automatic block signals, the conclusions of which were printed in the *Railroad Gazette* October 19, was accepted as a report of progress and referred back to the committee. The conclusions, as published, were based on information received in replies to a circular sent out by the committee, and some of these replies were printed in the report. From these we quote:

Foreign current in track circuit usually follows both rails and not any one particular rail, and it is not possible to connect battery to work in same direction as foreign current, except in rare cases where the conditions are such that foreign current traverses rail in opposite directions. The direction of flow changes during certain hours of the day, principally on account of location of cars on adjacent electric lines. Foreign currents are most likely to enter track circuits at iron bridges, planked highway crossings, at switches, and at electric road crossings. To guard against the current affecting the working of track relays, one member uses alternating current; one recommended removal of ballast from rail; one to equalize resistance of rails of circuit; two, installation of cut-section and arranging polarity of battery current; one, multiple relays and arranging polarity of battery current; and one uses single rail track circuit and insulates this rail as well as possible. One says: "Since a 1,600-ft. track section will 'pick up' from .5 to 2 amperes from a running stream, it would seem that steam roads which run along a river, as so many do, may expect considerable trouble from stray currents as the lines of the electric roads are extended."

Summing up on the question of overcoming the effects of foreign currents, one member says: "Hardly know as yet what to suggest. Have lately heard of several cases, found by trial, where 5-ohm relays have picked up after rear of train had passed a joint (in each circuit tested) from which the bond wires had been removed; the splice bars were on and bolts as tight as usual on good main-line track. Have no doubt foreign current from electric roads caused this; apparently the undue resistance through the splice bars of joint from which wires had been removed set up a sufficient difference of potential between rails to pick up the relay. It was found that a 9-ohm relay, substituted for the 5-ohm relays in each test, would not pick up; but, of course, the margin must have been very small and, under other conditions, a 9-ohm relay might not have been unaffected. This is one of the most serious situations that has come to my knowledge as, if the mere breaking of the bond wires on one joint, may cause a white failure [false clear indication], the risks seem very great. But it is not clear to me what remedy is to be applied."

Another says: "After 13 years fighting with foreign currents on automatic signal work. I have been convinced that their harmful effects can be over come in only two ways. One way is to insulate the rails of electric roads and steam roads in such manner as will prevent any current leakage to the earth. The other is to use a current for track circuits which will operate a track relay on which direct current will have no effect. The first scheme is not practicable on account of its excessive cost. The second can be applied at a moredate cost, and is entirely reliable."

SPECIFICATIONS FOR RELAYS.

The report of the committee on circuits for automatic block signals was made up principally of a code of specifications for direct current relays, and these were discussed very thoroughly through 11 of the 15 specifications when, on motion of Mr. Rudd, the association voted to accept the specifications as a whole, with a few changes which the committee agreed to. This motion was carried, in spite of numerous differences of opinion on certain points, because it was deemed important that a code of some kind, even if not satisfactory in every respect, should be adopted as a guide for the use of members generally during the ensuing year. These specifications are printed in another column. We note the principal amendments approved: The end of the last paragraph of article 3 was made to read "with jamb nuts or otherwise securely locked." In article 4 the first sentence was eliminated by a unanimous vote. In article 7 the words "form wound" were cut out, making the article read, all magnet coils must be convenient of application to cores, etc. The word "braid" was changed to "winding," and the third paragraph was made to read, "the ends of wires connecting magnets shall be soldered, non-corrosive flux being used; or they may be joined by means of substantially mounted metal binding posts provided with lock nuts." Article 8 was made to read, "binding posts shall be of such construction that they will not turn," etc. Article 9 was made to read, any other *metal* part.

Mr. Waldron, of the Interborough Rapid Transit, had found that in relays required to open every 1½ minutes throughout the day the trunnions wore out and particles of brass collected so as to hold the armature closed, giving a false clear signal. Mr. Clausen (C., M. & St. P.) had found that glass trunnions proved too brittle. The committee defended the requirement of jamb nuts (article 3) on the ground that this means of adjustment was necessary when, on account of damages by lightning, a large number of relays had to be renewed at one time. In such cases it is desirable to change relays from one signal to another.

On the construction of relays there was a long discussion about getting iron absolutely free from residual magnetism. The manufacturers claimed that this was a very severe requirement and one which had never been maintained in practice; while, on the other hand, the committee, supported by the signal engineers, declared that whatever the practice may have been, past or present, the only safe standard was the highest possible. Two members had had a half dozen or more false clear indications within one year from residual magnetism.

After the close of the discussion and the unanimous adoption of the report, as before stated, the association approved the suggestion of the committee that the code of standard symbols used in making drawings be enlarged in accordance with the practice of the four principal signal manufacturers.

MODIFICATION OF FLAGGING RULE.

At this point the meeting listened, by unanimous consent, to a short paper by Mr. W. W. Slater, Signal Engineer of the Southern Pacific, who took for his text the following proposed supplement to Rule 99 of the Standard Code of Train Rules:

"When a train is within block-signal limits, the flagman must go back to a point not less than one-fourth mile where a block signal not less than one-half mile can be seen clearly and distinctly; when positively known to be in position indicating "stop," he must place two torpedoes on the rail, and then return to his train. Under other conditions than covered specifically by this rule, flagman must be governed by Rule 99."

Mr. Slater said that this rule had been favorably considered by a number of the officers of the Southern Pacific, and not long ago it was laid before a meeting of superintendents who received it with marked enthusiasm, but the next morning their courage failed and they rescinded their brave resolution to recommend the adoption of the rule. Mr. Slater succinctly summarized his argument for the rule in the statement that if the large amount of money that has been spent in the installation of automatic block signals is to be put to profitable use it will be necessary to make of signals something more than ornaments. To see a flagman go back past one and even two block signals, standing in the stop position, as may frequently be seen, should convince any one of the absurdity of the present rules. Mr. Slater held that automatic block signals, as now made, are as reliable, as a measure of protection, as would be a flagman, if not more so. The semaphore being always in the same situation, where the engineman knows he can find it, it is not so liable to be disregarded as is the flagman, who is unexpected. Speaking informally, after the reading of his paper, Mr. Slater said that he had more confidence in the signals than in flagmen. He had found any number of superintendents and general managers who agree with him, but they have not the courage to take the initiative.

In the discussion on the paper it was brought out that Mr. Joseph Crawford, formerly Superintendent of the New York division of the Pennsylvania Railroad, had framed a rule something like this, as much as ten years ago, but had found that he was ahead of the times, the same as Mr. Slater finds himself now. Everybody admits that an automatic signal may possibly give a false clear indication but, even so, are we not ready to guarantee that after the signal has once gone to the stop position it will stay there until the train goes out of the section? Mr. Slater, for his part, was disposed to give such a guarantee.

The discussion was necessarily cut off for lack of time, no place having been assigned to it in the programme, but the meeting unanimously adopted a resolution, presented by Mr. Rudd, that inasmuch as the question of Rule 99 has been brought up, it is the sense of the Railway Signal Association that where a railroad is completely equipped with controlled manual signals, with full

equipment of track circuits to throw the signals automatically to the stop position on the passage of trains, flagging may be omitted; and that where automatic block signals are in use, the definition of the term "sufficient distance" as used in Rule 99, might well be framed with regard to the fixed signal [as proposed by Mr. Slater].

MISCELLANEOUS.

The next matter brought up was a paper by Professor Churchill, of the Corning Glass Works, on the "Optics of the Signal Lens." This paper is long and detailed and its reading was omitted for two reasons; first, because of lack of time, and second, because in its nature the subject is one that cannot be profitably taken up in report and referred back. The committee has postponed action because of the possibility that the Interstate Commerce Commission may make rulings which will affect this matter. The report of the committee on circuits for interlocking signals was dealt with in the same way, and a paper by Mr. F. G. Shaw on oil and gas a large meeting. Professor Churchill was thanked unanimously.

The report of the committee on costs was accepted as a progress heaters to keep switches from freezing was accepted with thanks but not read. Mr. Shaw described the apparatus of the International Switch & Signal Company which was used on the Boston of these steamers are for the Pittsburg Steamship Co., and three tend to except the reading of the reports of the Secretary and Treasurer, the election of officers and the selection of a place for the next annual meeting.

The report of the Secretary showed the number of members one year ago as 450 and the number at the present time 631, in addition to which a considerable number have been admitted but have not as yet qualified by paying the annual dues.

The place selected for the next annual meeting is Milwaukee. The officers elected for the ensuing year are: President, J. A. Peabody (C. & N.-W.), Chicago; Senior Vice-President, A. H. Rudd (P. R. R.), Philadelphia; Junior Vice-President, L. R. Clausen (C., M. & St. P.), Milwaukee; Secretary-Treasurer, C. C. Rosenberg, 12 North Linden street, Bethlehem, Pa.; members of Executive Committee, A. R. Raymer (P. & L. E.), H. S. Balliet (Grand Central Station, New York), and the three latest past Presidents, Messrs. H. C. Hope, J. C. Mock and C. H. Morrison.

EXHIBITS.

Adams & Westlake, Chicago.—Signal and switch lamps; C. & N.-W. double lamp; long-time founts and burners.

American Railway Signal Co., Cleveland, O.—Electric motor semaphore signal.

American Signal Co., Boston.—Model of a railroad and a car illustrating operation of an audible and visual locomotive cab signal, worked by a pulsating current.

American Vulcanized Fibre Company, Wilmington, Del.—Fibre insulations.

Battery Supplies Co., Newark, N. J.—Gladstone-Lalande batteries.

Bryant Zinc Co., Chicago, New York and San Francisco.—Battery supplies.

Dressel Railway Lamp Works, New York City.—Switch, semaphore and other signal lamps; marker lamps for passenger cars; long-burning lamps and founts.

Edison Mfg. Co., 31 Union Square, New York.—Edison primary batteries.

Electric Cable Co., Bridgeport, Conn.—"Voltax" insulated wires and cables.

Electric Storage Battery Co., Philadelphia.—Chloride accumulators and the Exide battery.

...ay Signal Co., New York.—An eight-lever electric interlocking machine of a new design and a very English appearance.

Galena Signal Oil Co., Franklin, Pa.—Perfection signal oil and railway safety oil.

General Electric Co., Schenectady, N. Y.—Electric motor semaphore signal, with motor at top of post; mercury-arc rectifier battery-charging panel.

General Railway Signal Co.—Eight-lever Taylor interlocking machine on iron pedestal; vertical electric motor for semaphore signal; two-arm electric-motor dwarf signal; switch movement of a new design; lock and block apparatus, with foot-power electric generator; switch indicator on iron post.

Gordon Battery Co., New York City.—The Gordon battery.

Gould Storage Battery Co., 1 West 34th street, New York.—Storage batteries in glass and rubber jars; batteries for train lighting and for electric vehicles.

Hall Signal Co., New York and Chicago.—Loree-Patenall semaphore, giving indications by upward inclinations; new standard relay with binding posts fastened in grooved insulating strips preventing turning; choke-coil lightning arresters made in units easily put together; motor for electro-gas signal; Style F electric motor signal with glass covered contact points; Style G three-position signal, with motor arranged to pull the arm to the clear position.

Hayes Track Appliance Co., Geneva, N. Y.—A Hayes lifting derail of new design made to use with N. Y. C. 100-lb. rails; Hayes pivot derails.

International Switch & Signal Co., 111 Purchase street, Boston, Mass.—Illustrated matter concerning gas and oil heaters to prevent freezing of switches.

Joseph Dixon Crucible Co., Jersey City, N. Y.—Graphite paint and pipe joint compound.

Leeds & Northrup Co., Philadelphia.—Portable electric testing apparatus and a special apparatus for testing submarine cables.

Rail Joint Co., New York City.—The "Continuous" rail joint; the Weber and the Wolhaupter insulated rail joints; new designs of insulated rail joint for N. Y. C. 100-lb. rail.

Railroad Signal Co., Chicago.—Full size crossing signals, two patterns; electric indicators.

Railroad Supply Company, Chicago.—Tie plates, bills, lightning arresters, channel pins and relays.

Schwarze Electric Co., Adrian, Mich.; J. Allen Haines, Manager, 324 Dearborn street, Chicago.—Crossing alarms, electric bells and buzzers.

Simplex Electrical Co., Boston.—Insulated wires.

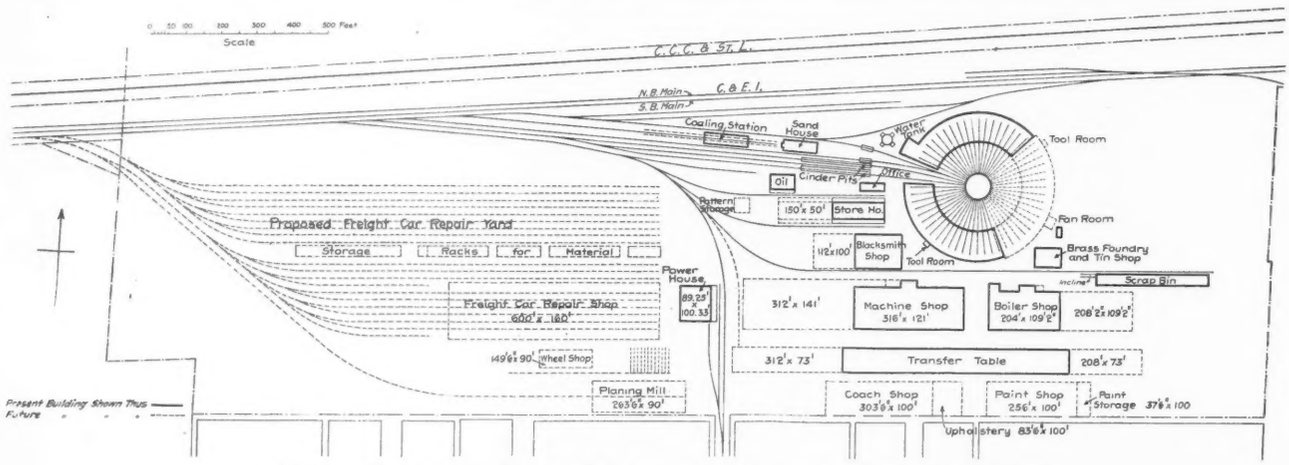
Union Switch & Signal Co., Swissvale, Pa.—Semaphore to give indications by upward inclination of arm; relays of different patterns; electric motor dwarf signal; Kopp glasses for signals. This exhibit included the electro pneumatic interlocking machine which was put in service at East Liberty, Pa., in August, 1884, and which was taken out in September of this year on account of changes in the tracks. This was one of the earliest electro-pneumatic machines.

Westinghouse Machine Company, East Pittsburg, Pa.—Storage batteries.

Whall & Co., C. H., 170 Summer street, Boston.—Fiber for insulated joints.

Large Extensions to Oaklawn Shops of Chicago & Eastern Illinois.

The Oaklawn shops of the Chicago & Eastern Illinois at Danville, Ill., were finished at the end of 1903. At that time the road had 159 locomotives which ran 5,053,869 miles during the year. Including locomotives now on order and shortly to be received, there will be 341 locomotives in operation at the end of the present year, and the estimated locomotive mileage for 1906, based on ten months' actual mileage, is 7,320,000. While the increase in number of locomotives is over 100 per cent., the increase in power has been much greater than this, so that the burden on the repair shops will have been much more than doubled by the end of the year. Enlargement of the shops to double their present capacity is therefore to be undertaken at once.



Oaklawn Shops of the Chicago & Eastern Illinois, Showing Proposed Additions.

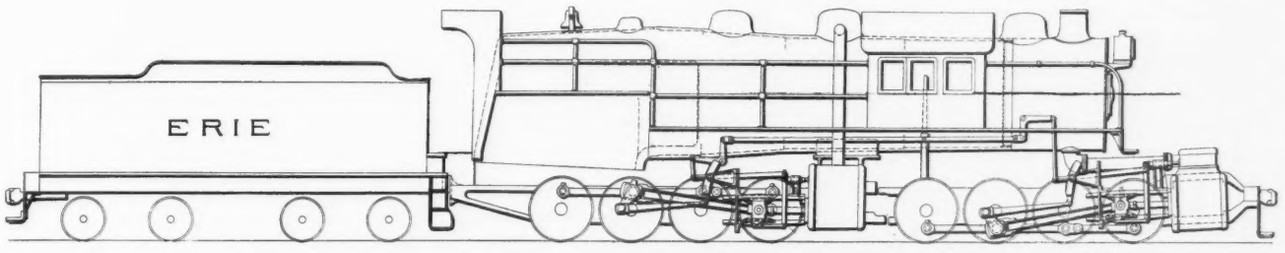
A ground plan of the present plant and the proposed extensions is shown herewith. All proposed work is indicated by broken lines. The work to be done immediately will double the size of the boiler shop, the machine and blacksmith shops and the storehouse. The roundhouse will be completed to the full circle by adding 17 stalls, and the transfer table will be extended to correspond to the increased length of the boiler and machine shops. A pattern storage house will be built west of the storehouse. No car work is done at these shops at present, the old shops on the west side of town being used for that purpose. But, as the plan indicates, the concentration of all this work at the Oaklawn plant is contemplated, and provision has been made accordingly in the layout. The future coach and paint shops are shown on the south side of the transfer table and the future freight car repair yard, with its necessary buildings, west of the locomotive plant.

As will be noted from the plan, the increase in area of the machine shop will more than double it. The new portion is to be 141 ft. wide, 20 ft. more than the present building, which will be widened this distance for the western half of its length. This will allow of a better arrangement of the tools than is possible in the present shop. The enlarged shop will have 28 pits. The extreme width of the new part of the roundhouse will be 90 ft. 4 in. and the total number of stalls in the completed house will be 56. The design of each addition will be uniform with that of the building to which it is made. The total estimated cost of the new work, for buildings, equipment, etc., is over $500,000.

Mallet Compounds for the Erie.

The Erie has ordered for freight service on its Susquehanna division three Mallet articulated compounds from the American Locomotive Company. The Mallet engine built by this company for the Baltimore & Ohio has proved the advantages of this type for service on heavy grades and sharp curves, and it is to meet such conditions that the Erie has ordered these three locomotives. These Erie engines, however, will be much heavier and more powerful than the one on the B. & O., or the latest example in this country of this type of locomotive, the Great Northern engines built by the Baldwin Locomotive Works, which were recently illustrated and described.

The proposed design here illustrated is for an engine weighing 410,000 lbs., with a tractive effort of 98,000 lbs. The engines will have conical boilers with 468 tubes 2¼ in. in diameter and 21 ft. long. They will have wide fireboxes, 114 in. wide and 126 in. long, with a heating surface of 348 sq. ft. The tank capacity will be 8,500 gals. and coal capacity, 16 tons. As the design of these engines is in the preliminary stage, little more can be given in regard to the details at this time, but the following comparison of their principal dimensions with those of the Baltimore & Ohio and Great Northern engines will be of interest:



Mallet Articulated (0-8-8-0) Compound Locomotive for the Erie Railroad.

Road	Balt. & Ohio.	Great Northern.	Erie.
Builder	Am. Loco. Co.	Baldwin.	Am. Loco. Co.
Type	0-6-6-0	2-6-6-2	0-8-8-0
Total weight	334,500 lbs.	355,000 lbs.	410,000 lbs.
Weight on drivers	334,500 lbs.	316,000 lbs.	410,000 lbs.
Cylinders	20 and 32x32 in.	21½ & 33x32 in.	25 and 39x28 in.
Diameter of drivers	56 in.	55 in.	51 in.
Tractive effort	71,500 lbs.	71,600 lbs.	98,000 lbs.
Working steam pressure	235 lbs.	200 lbs.	215 lbs.
Total wheel base	30 ft. 8 in.	44 ft. 10 in.	39 ft. 2 in.
Driving wheel base, rigid	10 ft.	10 ft.	14 ft. 3 in.
Total heating surface	5,585 sq. ft.	5,658 sq. ft.	6,108 sq. ft.
Grate area	72.2 "	78 "	100 "

Colombian Railroads.

A recently published book on the Republic of Colombia (no longer the United States of Colombia, but perhaps the most centralized government in America), by F. Loraine Petre, an Englishman interested in its prosperity, gives a description of all the railroads in the country. As their aggregate length is only 385 miles one might suppose they were few in number; but, in fact, there are twelve separate lines, the longest being 65 miles.

Colombia presents extraordinary difficulties in the way of transportation. The larger part of its area is a plain, part bordering the Caribbean Sea and part east of the mountains in the Orinoco and the Amazon valleys; but this part of the country is mostly a tropical wilderness, thinly peopled. The inhabited parts of Colombia are the valleys and lower slopes of the Cordilleras, which traverse the country from south to north in two parallel ranges. These can be crossed only in a few places by beasts of burden, and in still fewer by wheeled vehicles. The inhabited country is thus separated into three long strips which can communicate with each other only by circuitous routes and with great difficulty. Of these the one bordering the Pacific coast is narrow, but has two parts accessible to its most settled parts. It has an unhealthy climate, but has in former years produced a great deal of gold; since 1850 comparatively little. The populated part of Colombia east of the eastern range is small and reaches the sea most conveniently through Venezuela.

The valley between the western and the central range is drained by the Cauca river, which flows into the Magdalena after reaching the Caribbean plain. The Magdalena drains the valley between the central and the eastern ranges and empties into the Caribbean near the two principal ports, Puerto de Colombia and Cartagena. The Cauca is nearly as long as the Magdalena, and flows through a more productive country, but at no great distance from its mouth it is broken by falls and rapids, and throughout its upper course is much higher than the Magdalena. For about 200 miles of its upper course it is navigable at an average elevation of 3,500 ft. above the sea, in a beautiful and fertile valley. Then for a long distance rapids and falls prevent navigation, which is possible again for about 60 miles; but below, nearly to the point where the mountains sink into the plain, the stream is full of obstructions and again unnavigable.

The Magdalena, at the head of navigation, is about 1,100 ft. above the sea, where in the same latitude the elevation of the Cauca is 3,500 ft. This point is a little south of the latitude of Bogota, the capital, in about 4 deg. north latitude; but here the valley is quite narrow, and Bogota, in a straight line only 50 miles from the river, is 7,500 ft. higher up, while it is itself, like the city of Mexico, in the bed of a prehistoric lake, so that the summit between the river and Bogota is still higher.

While a very long stretch of the Magdalena is navigable (through about 8 deg. of latitude), and it forms the great artery of communication for Colombia, it is by no means easy of navigation. In the first place its mouth cannot be entered from the sea. Barranquilla, near its mouth, is reached by a railroad 18 miles long from Sabanilla (Puerto de Colombia), where there is an artificial harbor. From Cartagena, the old chief port, another railroad reaches the river at Calamar, 60 miles above Barranquilla, and from Barranquilla and Calamar, river steamboats drawing 3½ ft., go up the stream 480 miles from Calamar in about seven days to La Dorada, whence a railroad, 22 miles long, extends past the rapids to the navigable water above, where steamboats drawing 2½ ft. go 71 miles further to Girardot, the head of navigation, whence a railroad not quite completed, but already about 60 miles long, ascends the mountain toward the Bogota basin.

Thus communication sufficient perhaps for immediate needs is provided for the actual valley of the Magdalena. Unfortunately, the great need for transportation is chiefly in much more elevated regions. Colombia has important gold mines in the central range and on the western slope of the eastern range. To get heavy machinery up the Cauca is difficult; up the Magdalena, not easy; but to get it up from either valley to the mines is almost impossible. The railroads planned and partly built are designed largely for this purpose.

Strange to say, among the earliest railroads, are short lines extending from Bogota, the materials for which had to be carried over wretched roads from the river some 8,000 ft. up to the plateau. One of these, 25 miles long, extends from the city in a northwesterly direction to the edge of the plateau, whence it is possible to reach the river by a bad road. This will connect with the new "National" Railroad, now in operation from the head of navigation at Girardot for about 60 miles. Another line extends from Bogota, nearly due north, 31 miles to salt mines. Salt is a government monopoly. Another extends from Bogota southwest 18 miles to Sibate.

Other railroads connecting with the Magdalena steamboats run 12 miles, extending from Girardot, the head of navigation, southward to Espinal, and 43 miles from Puerto Berrio, about 450 miles above Barranquilla, westward toward Medellin, the capital of the former state of Antiogina, rich in mines.

Widely separated from these is the Buenaventura & Cali, planned to extend from the Pacific port Buenaventura across the western range of the Cordilleras to the upper Cauca valley, perhaps 70 miles. Only 7½ miles of this is built from Buenaventura eastward. It would be apparently of great value to the upper Cauca valley. Americans, Alfred Bishop Mason and Edward H. Mason, are prosecuting this enterprise.

The Santa Marta Railroad extends from the port of that name some 70 miles northeast of the mouth of the Magdalena, southward 42 miles, with 8 miles of branches, and is largely devoted to carrying bananas for the United Fruit Co. At a point 23 miles south of Santa Marta it reaches a lagoon, on which light draft steamboats ply to Barranquilla, 50 miles west.

The remaining line, the Cucuta Railroad, is on the eastern slope of the eastern range of the Cordilleras, from the town of that name, down the Zulia river 34 miles to navigable water near the Venezuela frontier, whence it has an outlet to Maracaibo.

The progress of railroad building, like all other progress, has been interrupted greatly in Colombia by internal disorders, which have succeeded each other at short intervals, and the last of which destroyed no inconsiderable part of the population. Of this population perhaps not more than 10 per cent. are pure-blooded whites, 15 per cent. pure-blooded civilized Indians and as much as 40 per

cent. mixed white and Indian blood, something like the bulk of the population of Mexico. The remainder are negroes and men of mixed negro and Indian and negro and Spanish blood. There is a comparatively small negro element in the upper country, however.

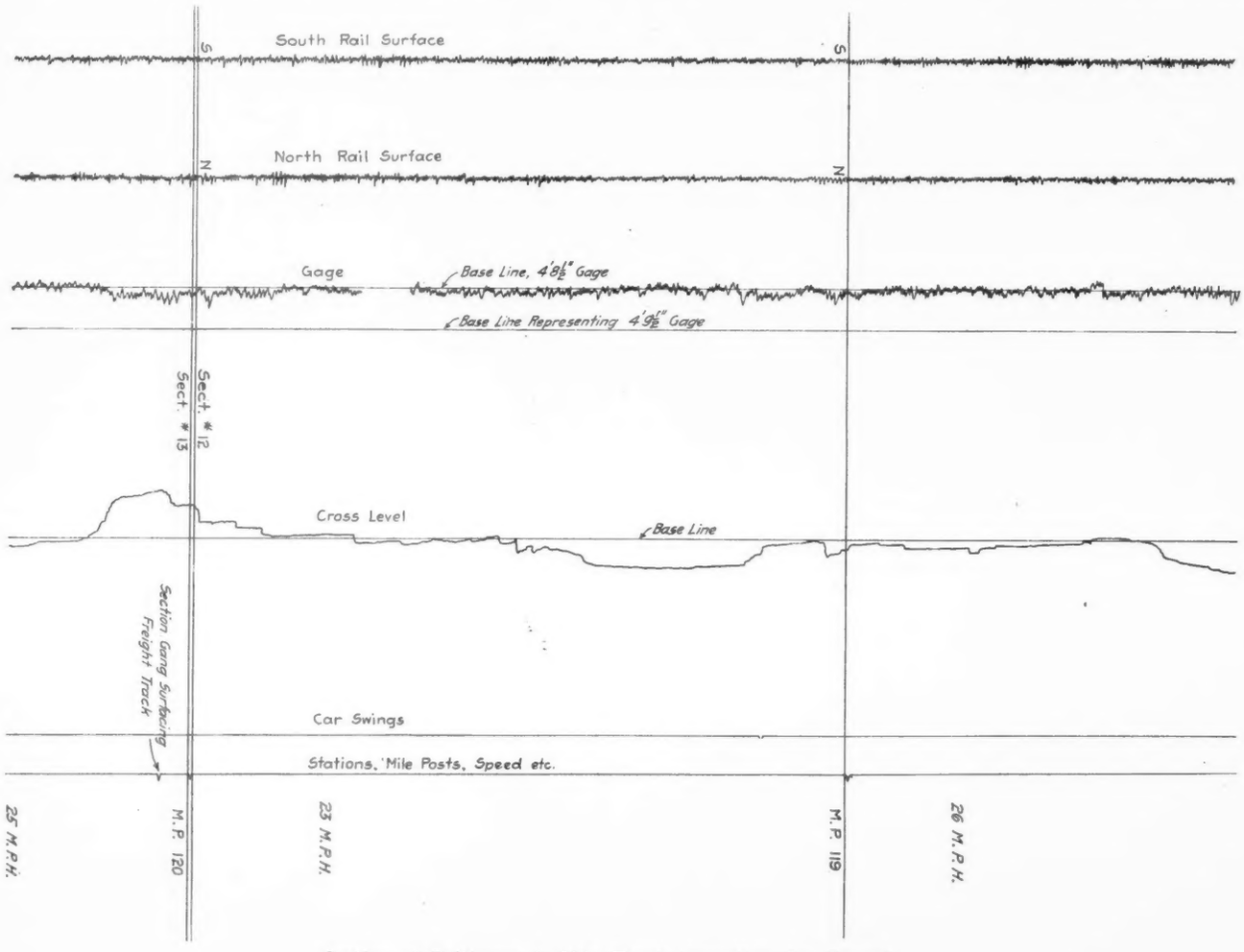
The present constitution provides a highly centralized government, and the President is virtually dictator. The actual President is regarded as a capable and wise man; but he was born in 1840. Even with an obedient army it is difficult to enforce order in such a country, because of the great difficulty of communication between its different sections, which will not be entirely removed by the construction of the most needed railroads, as the Pacific coast, Cauca valley and the Magdalena valley will remain isolated territories. With peace and a few hundred miles of railroad there ought to be great deevlopment of the gold mines and perhaps some other mines in Colombia.

Track Inspection Car of the Baltimore & Ohio.

The track inspection car of the Baltimore & Ohio, which has been in use three years, records on a moving strip of paper the surface of both rails, the gage, cross-level or superelevation of the rails and the lurches or car swings indicating bad alinement. A section of the record made by the car, reduced about one-half, is reproduced. The two upper lines show the surface of the two rails, and the waved line next below, the variation in gage. Two base lines ½ in. apart, representing 4 ft. 8½ in. gage and 4 ft. 9½ in. gage are traced by a fixed pencil, and the variation of the movable pencil from the upper or standard base line shows to exact scale one-half the amount the gage is wide or tight. The cross level record is made to reduced scale by a moving pencil, which oscillates across

Electrical Contacts of Surface Device.

truck and in the observation compartment at the back end. In making observations the car is usually attached directly behind a locomotive, and run over the road at a nearly constant speed of from 25 to 30 miles an hour. Brakes are used on the front truck only, and the wheels of the rear truck are made with flat treads and of uniform diameter. Two observers are required—one at the recording table to make the required notes on the moving paper, and



Section of Baltimore & Ohio Track Inspection Car Record.

the base line and indicates the variation from true level. On the base line next to the bottom an electromagnet, in circuit with suitable apparatus, indicates by a small offset, sudden lurches of the car. The bottom base line is for recording by means of a push button and electro-magnet the position of mile posts, stations, track tanks or any unusual object or condition.

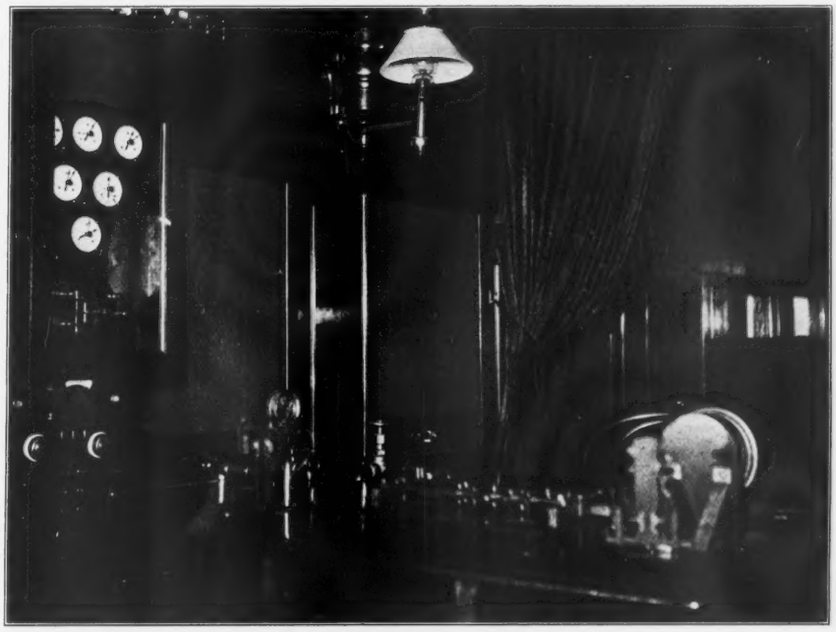
The car is an old private car mounted on two standard six-wheel trucks. All of the recording apparatus is mounted on the rear one looking out to record with a push button the position of mile posts, stations, etc. About 200 miles of track a day can be covered by the car under ordinary conditions, although 300 miles have been made under favorable circumstances. It requires 20 days or more to go over the entire system with the car.

The accompanying illustrations are from photographs taken when the car was in the shops for adjustment before starting on a trip. Two views of the rear truck show the arrangement of the gage

View of Truck Showing Gage Device.

and surface recording devices. The surface device consists of a 5-in. I-beam, mounted over the truck side sill and supported only at the ends by columns resting on the journal boxes of the front and back axles. On the middle journal box, outside and inside of the pedestal, two wide heavy plates are bolted and these work vertically in yokes attached to the I-beam above. This arrangement gives a fixed base line 10 ft. 6 in. long formed by the I-beam and a movable point in the center which rises and falls with variations in surface of the rail. On the outside standard of the middle axle are two adjustable electrical contacts and two corresponding contacts are fastened to the fixed I-beam. One contact records all variations in surface ⅜ in. or over and the other all variations ⅝ in. or over. The inside standard carries a lug working in a vertical slot in the yoke mounted on the I-beam. Above the lug and mounted on the yoke is a double brass sheave, and below it is a single sheave. Phosphor bronze wires are attached to the top and bottom of the movable lug; one passes down around the lower sheave and up over one of the top sheaves; the other passes up over the top sheave and both are carried in to the center of the car and up to the recording levers under the table in the observation room. The smallest variation in the relative position of the middle wheel and the fixed base line formed by the I-beam is thus transmitted to the recording pencil. This mechanism is applied on both sides of the truck to measure the surface of both rails simultaneously. To provide for movements of the truck relatively to the table the wires are carried over an idler sheave carried in a rocking frame under the recording table. This sheave maintains a uniform tension on the wires by means of a strong spring attached to the rocking frame and allows for all movements of the truck without appreciable error.

The gage device is a two-wheel trailing truck hung from two I-beams bolted on top of the six-wheel truck frame and arranged to be lifted clear of the track when desired by an air cylinder operated by a valve from within the car. The wheels are about 18 in. in diameter, and have flat treads and sharp flanges. They are mounted on short shafts or axles carried in bearings in the supporting yoke. To the ends of these axles are attached hardened racks working on a common pinion, the whole being surrounded by a strong spiral spring bearing on collars shrunk on the axles back of the racks. A cast-iron case encloses the whole mechanism. The spring forces the wheels out tight against the inside of the head of the rails and their movement inward is resisted by its pressure. A system of sheaves and wires similar to that used for the surface device transmits the relative movement of the two wheels in or out to the levers under the table which actuate the recording pencil. When the truck is drawn up off of the rails a spiral clutch automatically grips the axles and draws them inward against the spring pressure until they register 4 ft. 8 in. gage. They are locked in this position, and

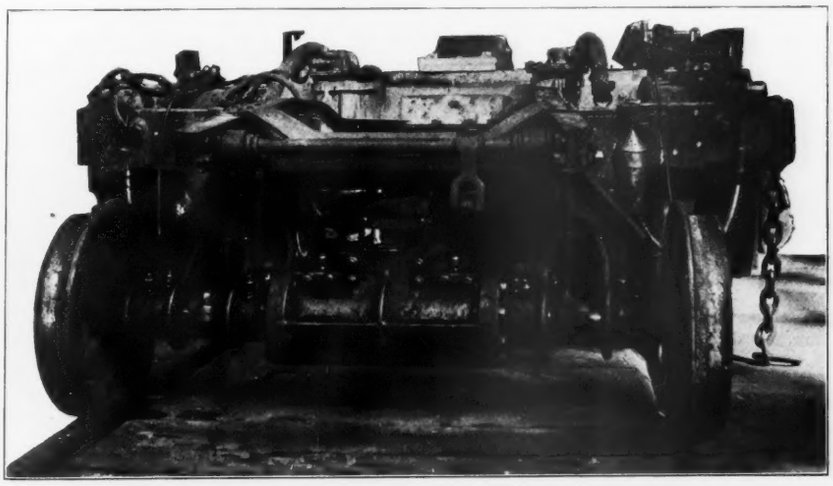


Interior of B. & O. Track Inspection Car Showing Electrical Clocks and Recording Table.

the recording pencil makes a straight line on the paper ¼ in. above the 4 ft. 8½ in. base line. The clutch releases automatically before the wheels drop down on the rails.

The apparatus for indicating the cross level consists of a heavy pendulum swung under the recording table in a tank of thick oil to retard sudden movements. This is connected by levers to the pencil above. Car swings are also recorded by a pendulum under the table which has a fan blade at the bottom to soften the swing. The top extends above the table and carries two small copper balls attached to the upper ends of pieces of spring steel about 6 in. long riveted at the bottom of the pendulum. These balls normally lie close against the pendulum, but any sudden swing causes them to fly out violently and strike a nest of fine copper wire attached to a support on the table. An electrical contact is thus made, which actuates the electro-magnet of the car swing pencil, and makes a notch in the line traced on the paper.

The paper is carried in rolls under the table, and is pulled under the pencils at a uniform space rate of 8 in. to the mile, the feed being attached to the shaft of the Boyer speed recorder and turned by the middle axle of the truck. A carbon and original are made at the same time. Mounted on one side of



End View of Gage Device Showing Lifting Shaft.

the car is a case containing six electrical counters or clocks. Two are used for recording the number of ⅜-in. low spots in each rail, two for ¾-in. low places and two for car swings, only one of which is used at present, the other having been installed for a second car swing device since abandoned. These record each electrical contact made. Current for operating them is obtained from a storage battery carried under one of the seats in the car.

Connected in the counter circuits are the electro-pneumatic valves for throwing a colored liquid on the track to mark the bad places. Three valves and nozzles are used, one ejecting a yellow wash on the rail to indicate car swings (bad alinement), and one for each rail ejecting a whitewash to mark all ⅜-in. low spots. These valves are mounted under the car floor, and have a nozzle projecting down close to the inside of the rail. The fluid is under air pressure from the brake system, and when a contact is made by either surface device or the car swing pendulum a small quantity is instantaneously squirted out by the electromagnet raising a plug valve against a spring. A spot from 6 in. to 1 ft. long is marked on the track within a foot or two of the low place or point where the car lurched.

Before taking the car out on the road it is carefully calibrated and adjusted on a piece of level test track true to gage, and a short preliminary run is usually made to verify the working of the apparatus. In making runs the observation room is connected by a bell with the cab of the locomotive to give signals, and all the counters are first set to zero. The table observer marks on the margin of the record the speed as shown by the recorder at frequent intervals, and identifies the mile posts, stations, etc. He also manipulates the three-way valve by which the gage device is raised and lowered to the track. The engineman gives a bell signal on approaching a switch crossing or other obstruction which might interfere with the truck wheels to warn the operator. The second observer takes general observations and attends to the wash valves.

Northern Pacific Passenger Station at Butte, Montana.

In using the car it has been found that while the gage and surface devices are accurate and reliable, the cross-level and car-swing devices do not give equally good results. The heavy pendulum of the cross-level apparatus is affected by centrifugal force when rounding curves, and tends to displace laterally in proportion to the speed. Not much reliance is placed on it, but no apparatus yet designed has proved more accurate than the device used. A number of different devices have been tried to record car swings, but without complete success. The one now used, which is the best of those tried, is defective in being too sensitive to small disturbances. The pendulum occasionally vibrates with increasing amplitude and finally makes a contact when the car gives only a slight lurch. The device indicates in a general way, however, the riding qualities of the track and always detects any bad lurches.

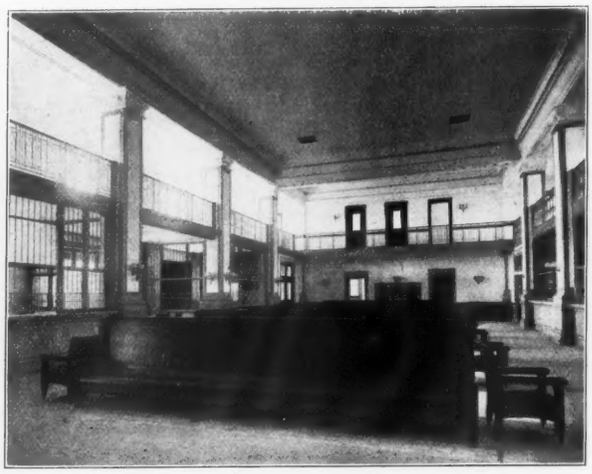
The car is taken over the entire system in the fall of each year, and records are kept for each division separately. The carbon copy is given to the division engineer for future reference, and the original is preserved as an office record. After the inspection is completed a table is prepared showing the order of merit of the divisions, although no system of awarding prizes is in force. In making up this table an arbitrary basis is assumed. The total number of ⅜-in. low joints, ⅝-in. low joints and car swings on each division is taken from the electrical clocks, and the average number per mile of track computed for each. A standard of perfection of 100 is assumed and arbitrary values of 0.2 for ⅜-in. low joints, 0.8 for ⅝-in. low joints and 0.4 for car swings are assigned. The average number per mile is multiplied by these values and the total is subtracted from 100, expressing the standard for each division as a per cent.

The idea of the car was originated by Mr. L. F. Loree, who was at the time President of the Baltimore & Ohio. The general features were outlined by Mr. M. L. Byers, then Engineer of Maintenance of Way, who turned over the detail work to Dr. Coleman Sellers, of Philadelphia. After the car was built it was changed and improved in a number of its details under the direction of Mr. A. A. Miller, Assistant Engineer. We are indebted to Mr. J. B. Dickson, Chief Engineer of Maintenance of Way, for the illustrations and information.

New Northern Pacific Passenger Station at Butte.

The new passenger station of the Northern Pacific, recently opened at Butte, Mont., replaces a 24 ft. x 68 ft. building which the city had long since outgrown. Two views of the new station are shown herewith. The baggage and express rooms and the restaurant are in detached, one-story, 38 ft. x 112 ft. buildings on each side of the two-story main building. The main building is 62½ ft. x 133 ft., with a main waiting room 37 ft. x 89 ft. Adjoining the main waiting room, at one end of the building, is a smoking room for men, 22 ft. x 24 ft., and at the other end is a women's room of the same size. In the second story over these rooms are offices opening on a balcony which surrounds the main waiting room.

The walls of the buildings are brick, the exposed portions being vitrified paving brick with limestone trimmings. Foundations are concrete. The interior finish of the main building consists of terraza floor, terraza and mosaic base, and plaster walls and ceiling. The woodwork is clear white oak. The dining room finish is like that of the main building. The kitchen and the baggage and express rooms have cement floors. The cost of the buildings was $40,000.



Main Waiting Room in Butte Station.

Car Cleaning.*

BY B. F. FLORY,
Mechanical Engineer, Central Railroad of New Jersey.

The car-cleaning force should be under the direction of a man who understands the effects of the various cleaners and methods on the different parts of the car. The yards should be so located and of such size that the force can go from one car to another without waste of time. Racks should be put in at convenient places for the cleaning of carpets, seats, mattresses, etc. Air or vacuum lines should be run through the entire yard, so that cars can be blown out or cleaned with a vacuum system without having to move the car. The car should be built with as little moulding or carving as possible to give a good appearance. The car with a plain interior, relieved by ornamentation by inlaying, presents few places for the dust to lie on. Steam pipes should be kept 3 or 4 in. from the floor. Seats should have swing foot-rests, and the seat ends preferably made in one piece. The seats for smoking cars should be of leather, or of some substitute. The hoppers should be placed so that they will not foul the trucks.

For cleaning the outside body of the car soap and water are used by some roads. This has to be done quickly, especially in warm weather, as part of the soap may dry before it can be wiped off. This soon gets into the varnish, and every time it gets wet the soap eats into it deeper and deeper and soon spoils the looks of the car.

*Extracts from a paper read before the New York Railroad Club, Oct. 19, 1906.

Cold water applied to cars in warm weather and hot water applied to cars in cold weather will deaden the varnish.

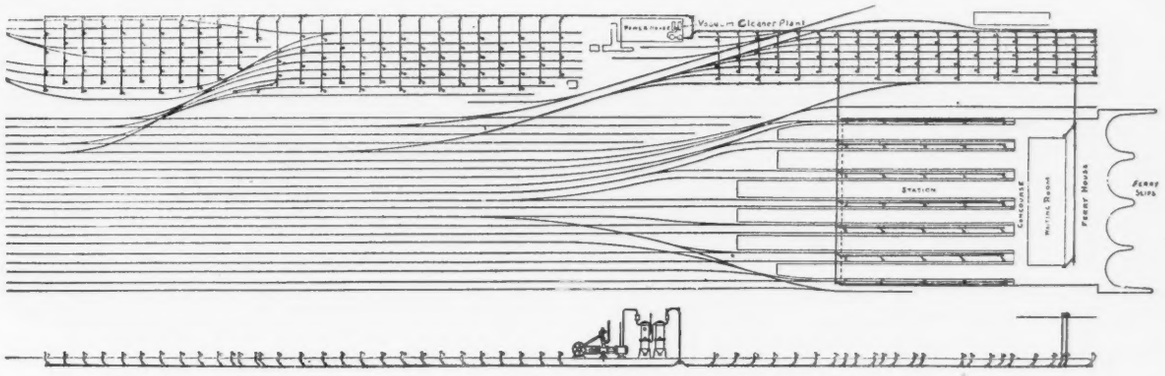
Oxalic acid is sometimes used when cars are very dirty, and if used properly and followed by oil it brings out luster and adds life to the varnish. The car, however, should be washed quickly with water after the oxalic acid is put on and before the oil is applied. Oil emulsion is probably the best thing for cleaning the car if applied at proper intervals. It is not necessary to apply this every trip. The car can be washed or rubbed off dry, but oil emulsion should be used about every two months. This will keep the varnish in good shape between shoppings.

The cleaning of the outside of the car varies greatly, according to the condition of the road. On the Central Railroad of New Jersey, which has only one short tunnel, and where anthracite coal is used, we do not find it necessary to use an oil emulsion. We simply wipe off the cars dry, or when they have been in rain or snow they are washed off with clear water. For roads having a number of tunnels and using soft coal, this would not suffice, and some of the other methods mentioned above should be used.

For trucks, wiping with dry waste or with waste with a little oil on it, depending on the condition, is all that is usually necessary. A corn broom, with a little oil on it, is also good if the trucks are dirty. To clean the floor it is best to have the dirt blown out or swept up and then scrubbed with soap and water. The headlinings should be cleaned with mild soap and water and then rinsed with clear water. The interior woodwork should be kept clean by washing with soap and water or dry-wiped with a soft cloth. The water cooler should be cleaned out thoroughly at least once a week.

Curtains having pantasote or other similar material for the backs should be wiped about once a month with a damp cloth. For cleaning the seats, backs and carpets, compressed air or a vacuum system is used. With compressed air some roads leave all the seats and backs in place and then blow them out. Others place the seats in the windows and then blow them out. The carpets are drop according to the number opened. The dust and refuse taken from the car is drawn through the pipe lines to the dry separator and enters on a centrifugal line. Within this separator there is an inner cylinder projecting nearly half-way to the center of the separator. The dust takes a centrifugal movement downward around the annular space between the inner cylinder and outer casing, and 90 per cent. is deposited at the bottom of the separator. The lighter particles of dust are drawn up through the inner casings by slow suction as the velocity of the air has been changed, the inlet pipe being 5 in. and the inner cylinder through which the suction must pass is 24 in. diameter. The light dust then passes into a second separator; which is partly filled with water. The water covers a brass disc, which is perforated by several thousand $^1/_{16}$ in. holes. Just above this disc a hood is placed, leaving an annular space between it and the casing for the passage of air, when the air enters underneath the disc which is covered with water. The bubbles of air are large, but upon striking the disc they are broken up into very small bubbles, which creates a foam or fountain which washes out the partially dust-laden air. The hood deflects the air and water against the side of the casing, so that there is no water carried over to the pump. The air is practically cleansed before going to the vacuum cylinder and is then exhausted to the atmosphere. When the machine is shut down the dry separator is opened and the dust drops out and is thrown into the ash-pit under the grates. The valve connection with the bottom of the wet separator is also opened and the muddy water flows into the sewer. The amount of dust taken out from the dry separator averages about one bushel and a half per day. The fittings for the pipes are all of large radius to provide for easy movement of the air. The pipes and all fittings are of galvanized iron and are painted with asphaltum.

The maximum number of nozzles that we can use and retain 14 in. of vacuum, which is what should be had for rapid cleaning is twelve. The vacuum sometimes runs below this if there are any leaks in the pipe line, or if the men leave the nozzle lying down and



Plan of Car Cleaning Yard at Communipaw Terminal; Central Railroad of New Jersey.

not cleaned in the car, but are taken to racks and then blown out. A test made on one road in the vicinity of New York showed that it took one man about one hour to blow out a car with seats and backs in place. After this the car was dusted by two women, taking thirty minutes per car. On another road, where the seats were removed and blown outside, it took two men one hour to blow out the car and then took two men one-half hour to dust the car. On another road, where the seats are placed in the windows, two men can do about eight cars per day, and the dusting takes two women one hour per car. The carpets can be cleaned at the rate of about five per hour. Taking the average, it takes two men one hour to blow out a car and one-half hour to dust it. At the usual rate of wages paid for this work it would amount to three hours' work at 15 cents, or 45 cents per car. This does not include the cleaning of the carpets, the cost of cleaning which is about 3 cents apiece.

The Central Railroad of New Jersey has installed, at its terminal at Jersey City, a vacuum plant for cleaning both the cars and the station. The plant has been in operation over two years, and was installed at a cost of approximately $18,000. The plant consists of two steam-driven double-acting pumps with vacuum cylinder 20 in. in diameter and 12 in. stroke. These pumps are 20 h.p. each. The pumps are arranged to operate together or independently, and have 5 in. suction connections to the separators. From the separators one header extends west 2,400 ft., being reduced proportionally from 5 in. to 4 in. to 3 in., with 2 in. lateral lines which run at intervals of every 60 ft., or about a car length, distributing outlets to the coach-cleaning yards having ten tracks. On the east end the main line extends 1,300 ft., the pipe having been reduced in the same proportion as on the west and having outlets every 60 ft. A layout of the piping of the yards is shown in the accompanying drawing.

The operation of the plant is as follows: When the pumps are put in operation the air is immediately exhausted from the separators and the pipe lines. With no outlets open the vacuum gage will show about 29 in., and as the outlets are opened the vacuum will do not shut off the air. The size of the hose is 1 in. inside diameter. Two sizes of nozzles are used, one 12 in. long with an opening of ⅛ in. wide, which is used for carpets, and one 8 in. long with the same width of opening, which is used for seats and cushions.

The following is the number of cars cleaned per month with the vacuum system: 270 Pullman sleepers, 510 Pullman chair cars, 272 60-ft. coaches, 92 50-ft. coaches, 18 combination cars (having plush seats), 31 café cars, 62 dining cars, 78 club cars, 13 private cars, a total of 1,346 cars cleaned per month.

The cleaning of the Pullman cars is done by a force of nine men who have nothing to do with the cleaning of other cars. The sleeping cars have the mattresses, seats, backs and carpets removed and all are cleaned outside on racks. They could just as well be cleaned inside the car, but it is more sanitary to have them cleaned where they will get fresh air. The Pullman chair cars are usually cleaned without having anything removed. The same force is used cleaning the Pullman cars with the vacuum system as when compressed air was used; the number of cars cleaned, however, is much greater. The same number of sleeping cars was cleaned by compressed air, but only one-third as many of the chair cars, or about 170 chair cars per month instead of 510. The chair cars, which run to Washington, are cleaned three times a week, and those which run to Philadelphia, Point Pleasant and Atlantic City only twice. On these latter runs only anthracite coal is used, while on the Washington run bituminous coal is used between Philadelphia and Washington.

For our own cars we have a force of three men, two who work on seats and cushions and one on carpets. On a 60-ft. coach, with 37 seats, one man can clean the seats and backs of ten coaches per day of ten hours, at a cost of 13½ cents per coach. For cleaning the interior woodwork, by wiping, and the floor by brushing up, it costs about 10 cents per car. The cost for the same work done by compressed air is 45 cents.

The following is the average number of cars cleaned per month when the compressed air system was used: Pullman sleepers, 270;

Pullman chair cars, 170; C. R. R. of N. J. cars, 275. When compressed air was used we had a 45-h.p. compressor in operation, with about the same amount of pipe as with the vacuum system. The same force is used with the vacuum system as when compressed air was used; and as the tables show, 566 C. R. R. of N. J. cars are cleaned per month with the vacuum system, or twice as many as when compressed air was used.

The carpets are cleaned by one man, who makes his hose connection at the middle car of the train to be cleaned and brings all the carpets to that car. A train of eight cars will have their carpets cleaned in one hour. It is quicker to clean in this manner than to move the hose to every car. The cost for cleaning carpets is about 2 cents, against 3 cents for the compressed air. The carpets on all important trains are cleaned nearly every day. On smoking cars having leather, or its substitutes, for seats, the vacuum system is not used except on the carpets.

The advantages of the vacuum system over the compressed air system are as follows: Costs less to clean a car, or the same force can be used to clean more cars. Other men can make repairs in the car, if needed, at the same time the car is being cleaned. All dust is removed from the seats, backs and carpets. The varnish is not injured by having particles of dust or cinders blown against it, as is the case with compressed air. Will keep equipment in better shape and the traveling public in better humor. When equipment is scarce, cars can be cleaned and turned in considerably shorter time than with compresesd air.

There are some places, however, where compressed air is more satisfactory, as in getting the dust and cinders out from between double windows, from ventilators and from the lamps. After this dirt and cinders are blown out, it is, of course, necessary to brush them up or take them away by a vacuum system.

Signals for the Market Street Elevated and Subway, Philadelphia.

The new Market street elevated and subway line of the Philadelphia Rapid Transit Co. was described in the *Railroad Gazette*, August 18 and 25, 1905. The completed part of the subway extends under Market street from Fifteenth street to Twenty-third street and is four-tracked, the two outside tracks carrying surface cars and the inside tracks carrying elevated trains. There is a station at Fifteenth street for elevated and surface cars and stations at Nineteenth and Twenty-fourth streets for surface cars. Both surface and elevated tracks cross the Schuylkill river on a four-track bridge north of the Market street bridge, and on the west bank the elevated tracks run off on the double track elevated structure, continuing on out Market street, while the surface car tracks descend to the street level and run underneath the elevated road. At the present time the surface tracks in the subway are in use, a small number of cars being run down to Fifteenth street to relieve the congestion on the surface tracks east of the river. The elevated structure and stations are completed, and one track is laid from the bridge to Sixty-eighth street, the western terminal; the other track is laid for part of the distance and will be ready for use in a few weeks. Of course, no trains are yet running on the elevated or on the inside tracks of the subway.

Typical Section of Market Street Elevated Signaling.

The signal apparatus for the elevated section and the inside or express tracks in the subway is being made and installed by the Union Switch & Signal Co., Swissvale, Pa. The system to be used is substantially the same as that installed by the same company in the New York subway (see *Railroad Gazette*, October 7, 1904), with some modifications in details to fit the different conditions of operation and as a result of experience with the earlier apparatus.

In the subway section, including the Schuylkill river bridge, a total distance of about 5,000 ft., there are four block sections and an interlocking zone at the Fifteenth street station. The average length of the block section is 1,000 ft. On the elevated section, from the west bank of the Schuylkill river to the Sixty-eighth street terminal, about 4¼ miles, there are 23 block sections on the westbound track and 22 sections on the eastbound track. These sections vary in length from 400 ft. to 1,400 ft., the longest sections being the approaches to the stations.

One track rail is insulated from the other and carries the return power circuit at 550 volts. At Fifty-sixth street is an A. C. rotary sub-station for supplying the power circuits. Current is tapped out here to a step-down transformer, which reduces the 13,200-volt 3-phase current to 1,100-volt 2-phase current, which is split up into two single-phase currents and used on the A. C. signal mains, one phase being run in each direction from the sub-station. At the end of each block section a step-down transformer, with two secondary coils, delivers current at about 12 volts for the track circuit and 50 volts for the signal lamp. The semaphore signals on the elevated section and the automatic stops are operated by compressed air carried in pipe lines from three points, Sixty-eighth street terminal, Thirty-third street power-house and Fifteenth street terminal. At Sixty-eighth street, where a steam heating plant has been put in, and at Thirty-third street the compressors are steam-driven, but at Fifteenth street a motor-driven compressor will be installed.

The signals in the subway are the same in form and general arrangement as those used in the New York subway, with two modifications. The small semaphore disks have been discarded, and instead of colored glass slides operated by electro-pneumatic valves in the relay circuits two sets of colored lamps are used behind each bull's-eye. The front and back contacts of the track circuit relays make or break the lamp circuits direct. The color indications will be the same; red for stop, green for clear or proceed and yellow for caution. All the other details, relays, inductance coils, grid resistance and automatic stop are identical with the apparatus installed in the New York subway. The double overlap is used, so that one full block section separates a train from the one ahead at all times.

On the elevated section, which is a fairly level tangent, the signals are semaphores mounted on iron poles 15 ft. above the track. The blades are operated by direct acting air cylinders in the box at the base of the pole. As all trains on the elevated will normally make all station stops the distant signal at the approach to the station has been omitted and the overlap of the section beyond the station done away with, so that a following train can run up to the home signal nearest the station and enter the station block immediately after the preceding train has cleared the platform. A short overlap of 600 ft. to 700 ft. is used ahead of the home signal approaching a station where the station block is over 1,000 ft. long. This is an additional safeguard for a train stopped just beyond the home signal and still permits a following train to run up to the home signal while a train is standing at a station.

There will be two electro-pneumatic interlocking plants, one at Sixty-eighth street loop and one at Fifteenth street, where there is a cross-over at the entrance to the station for switching trains from the eastbound to the westbound track. The Fifteenth street machine, which is of standard design, will control two switches, four signals and two dwarfs. The machine at Sixty-eighth street will control four switches, 13 signals and six dwarfs.

We are indebted to Mr. William S. Twining, Chief Engineer of the Philadelphia Rapid Transit Co., for the information.

Records of Fast Runs.

The full page table of fast and unusual runs of steam locomotives published herewith is of the nature of an index to records which have been published in the *Railroad Gazette* during the past 26 years. It is a condensation and revision of the tables published in the issues of June 11, 1897; January 11, 1901, and December 15, 1905. The table of 1897 was published in *Modern Locomotives* and the table as now revised appears on page 98 of the *Locomotive Dictionary*, which has just been published by the *Railroad Gazette*.

In the table the time given is in each case that from the beginning to the end of the run, including stops.

The improvement which has been made in locomotive service since 1895 is shown not so much in higher speeds per se as in the heavier trains now hauled without diminution of speed, and at sustained speeds for long distances.

Concerning certain runs which appear in the table, the following notes will be found of interest:

March 1, 1901.—Grade descending, mostly at 30 ft. per mile.

March 24, 1902.—Descending grade; some of the way 32 ft. per mile.

June 21, 1902.—Altoona is 861 ft. 6 in. higher than Harrisburg.

June 19, 1903.—Ran through without a stop; two engines all the way. Weight of train 1,080,000 lbs.

June 9, 1904.—Engines changed at Bristol. One car left at Bristol. Weight shown is average for whole journey. First engine had four drivers 6 ft. 8 in. in diameter; cylinders, 18 in. x 21 in.; second engine as shown in table.

1905.—Eighteen hours is the regular schedule time of one day train each way between New York and Chicago over the New York Central, and of one over the Pennsylvania. The Pennsylvania line is about 60 miles shorter than the New York Central.

June 19, 1906.—One more car than on the run of July 20, 1904. A distance of 12 miles was traversed in eight minutes.

The following table, taken from the larger one, shows the best

FAST AND UNUSUAL RUNS FROM 1880 TO 1906.

Month, day, year.	Railroad.	From.	To.	Dist. Miles.	Time. h. m. s.	Speed miles. per H.	Cars. Weight. No.	Cars. Weight. Lbs.	Locomotives. Type.	Locomotives. Cyls.	Locomotives. Diam. drivers. In.	Locomotives. Weight on drivers. Lbs.	Locomotives. Weight of engine. Lbs.	Month, day, year *
6-14-'80	P. R. R.	Philadelphia.	Jersey City.	90	1:33:00	58.06	2	....	4-4-0	....	..	....	....	6-25-'80
0- 0-'80	Gt. N. (Eng.)	London.	Grantham.	105.5	1:51:00	66.5	.	....	4-4-2	....	96	....	....	8- 6-'80
4-22-'82	W. Jersey.	Camden.	Cape May.	81.5	1:23:30	58.63	3	....	4-4-0	....	..	....	....	4-28-'82
7-12-'83	S. B. & N. Y.	Syracuse.	Binghamton.	79	1:23:00	57.11	2	....	4-4-0	....	..	....	..	7-20-'83
5- 9-'84	P. & R.	N. Y. Div.	M. P. 48.	14	0:11:19	74.2*	4	....	4-4-0	....	..	....	.. .	1- 6-'84
5- 8-'85	L. S. and N. Y. C.	Chicago.	New York.	964	22:45:00	42.38		....	.. .	....	..	....	....	5-15-'85
7- 9-'85	W. Shore.	Alabama.	Gen. Junc.	36.3	0:30:00	72.60	3	153,660	4-4-0	18x24	68	62,500	94,500	8-28-'85
6-17-'86	C., B. & Q.	Princeton.	Burlington.	170	2:58:00	57.3	.	....	4 4-0	....	..	....	....	7- 2-'86
7- 5-'86	Wabash.	K. City.	Peru.	563	13:45:00	41	..	....	. ...	. .	..	.. .	....	7-16-'86
8- 8-'86	N. Y. C. & H. R	Syracuse.	Fairport.	70.25	1:01:20	68.73	2	....	4-4 0	....	.	....	....	8-13-'86
7-10-'88	L. & N. W.-Cal.	London.	Edinboro.	400	7:52:00	50.85	.	....	.....	....	.	....	....	.....
8- 0-'88	L. & N. W.	Crewe.	Preston.	51	0:50:00	61.20	.	....	.....	....	.	.	....	8-24-'88
8- 0-'88	L. & N. W.	Preston.	Carlisle.	90	1:30:00	60		....	....	....	..	..	...	8-24-'88
8-30-'88	N. E. (Eng.)	York.	Newcastle.	80.5	1:18:00	62	7	....	4-2-2	18x24	84	....	... .	12-14-'88
8-31-'88	Gt. N. (Eng.)	London.	Edinboro.	392.5	7:26:45	52 7	.	....	....	....	..	73,000	....	10- 5-'88
4- 8-'89	C. & N. W.	Chicago.	Council Bluffs.	490	12:30:00	39.2	4	...	4-4-0	18x24	63	59,850	....	.....
5-19-'89	P., F. W. & C.	Ft. Wayne.	Chicago.	148.3	2:59:00	49.7	5	...	4-4-0	18x24	62	..	91,900	.....
5-26-'89	Mich. C.	S. Bridge.	Chicago.	511	11:41:00	43.74	.	....	.....	....	.	....	...	6- 6-'90
3-10-'90	P. & R.	Philadelphia.	Jersey City.	90	1:25:00	63.53	1	...	.....	....	..	...	....	3-14-'90
3-10-'90	P. R. R.	J. City.	Washington	226	4:18:00	52.56	3	....	....	....	..	. .	....	3-14-'90
3-10-'90	P. R. R.	Washington	Jersey City.	226	4:19:00	52.35	3	....	....	....	..	....	....	3-14-'90
6-22-'91	N. Y. C. & H. R.	New York.	Buffalo.	439.52	8:58:00	49.2	6	515,700	4-4-0	19x24	..	....	121,300	6-26-'91
8- 0-'91	Canadian Pac.	Vancouver.	Brockville.	2,792	76:31:00	36.49	3	. .	.....	....	..	....	....	9-18-'91
9-14-'91	N. Y. C. & H. R.	New York.	E. Buffalo.	436.32	7:17:30	59.56	..	...	4-4-0	19x24	..	....	....	9-18-'91
10-16-'91	N. Ry. (France)	Paris.	Calais.	184	3:43:00	49.51	12	311,360	... .	13¼, 20¾x25	84	67,200	96,320	.....
11-28-'91	P. R. R.	Jersey City.	Washington.	227	4:11:00	54.22	3	250,000	.....	.....	..	....	.. .	12- 4-'91
12-22-'91	B. & O.	Philadelphia.	Canton.	91.6	1:41:00	54.41	.	.. .	.....	....	..	....	....	1- 1-'92
3-28-'92	N. Y. C. & H. R.	Oneida.	De Witt.	21.37	0:17:40	72.69	..	....	4-4-0	19x24	78	81,400	126,150	4- 7-'93
11-18-'92	Cent. N. J.	Fanwood.	.....	1	0:00:37	97.3	4	228,800	.....	13, 22 x24	78	88,400	123,800	11-25-'92
11-18-'92	P. & R.	Jenkintown.	L'horne	5	0:03:25	87.8	..	....	.....	...		....	....	.....
12- 0-'92	L. & N. W.	Crewe.	Rugby.	76	1:11:00	64.23	3	..	.....	....	..	....	....	.....
5- 9-'93	N. Y. C. & H. R.	Grimesville.	.....	1	0:00:35	102.8	4	...	4-4-0	19x24	86	84,000	124,000	6- 2-'93
5-19-'93	N. Y. C. & H. R.	Syracuse.	E. Buffalo.	146	2:21:00	62.13	..	. .	4-4-0	19x24	84	84,000	124,000	5-26-'93
5-19-'93	N. Y. C. & H. R.	Looneyville.	Grimesville.	5	0:03:00	100	..	....	4-4-0	19x24	84	84,000	124,000	5-26-'93
5-28-'93	N. Y. C. & H. R. L. S. & M. S.	New York.	Chicago.	964	19:57:00	48.2	..	....	.....	17x24	72	65,100	104,600	6- 2-'93
8-28-'93	P., C., C. & St. L.	Seymour.	N. Tower.	42	0:35:34	70.96	5	....	4-4-0	. .	68	....	....	8-15-'93
3-23-'94	C. & N. W.	C. Bluffs.	Chicago.	488	12:52:00	41.1	8	....	.....	....	.	....	....	4- 6-'94
4-17-'94	L. S. & M. S.	Cleveland.	Erie.	95.5	1:35:00	60.32	..	....	4-6-0	....	..	....	....	4-27-'94
8-26-'94	A. C. Line.	Jacksonville.	Washington.	780.8	15:49:00	49.36	..	....	.....	....	..	....	....	9-21-'94
4- 0-'95	C., B. & Q.	Chicago.	G'burg.	163	2:45:00	59.27	6	....	2-6-0	19x24	68	101,000	120,000	12-13-'95
4-21-'95	Camden & Atl	Camden.	Atlantic City.	58.3	0:45:45	76.46	1	....	4-4-0	....	78	87,300	122,600	1- 3-'95
8-21-'95	West Coast.	London.	Aberdeen.	540	8:55:00	60.56	..	....	.....	....	..	....	.. .	9-13-'95
8-21-'95	East Coast.	London.	Aberdeen.	523	8:40:00	60.35	..	....	.....	....	..	....	.. .	9-13-'95
9-11-'95	N. Y. C. & H. R.	New York.	E. Buffalo.	436.32	6:51:56	63.54	..	....	4-4-0	....	..	....	....	9-27-'95
9-24-'95	N. Y. C. & H. R.	Albany	Syracuse.	147.84	2:10:00	68.23	2	....	4-4-0	19x24	..	84,000	124,000	10- 4-'95
10-24-'95	L. S. & M. S.	Erie.	Buffalo.	86	1:10:46	72.91	..	....	4-6-0	17x24	66	88,500	113,500	11- 1-'95
10-24-'95	L. S. & M. S.	Chicago.	Buffalo.	510.1	8:01:07	63.61	..	....	....	....	..	....	....	11- 1-'95
10-24-'95	P. R. R.	J. City.	Philadelphia.	89.6	1:33:21	57.6	6	548,657	4-4-0	18½x26	..	91,600	134,800	1-17-'96
5- 7-'96	Mich. C.	Windsor.	St. Thomas.	11.2	1:43:05	64.72	3	230,050	4-6-0	19x24	68	96,300	123,500	.....
5- 7-'96	Mich. C.	St. Thomas.	Fort Erie.	118.2	1:47:15	66.13	3	230,050	4-6-0	19x24	68	96,300	123,500	.....
6-10-'96	Atlantic City.	Camden.	Atlantic City.	55.5	0:48:00	69.4	6	....	4-4-2	13, 22 x26	84½	80,000	141,000	6-19-'96
6-20-'96	Atlantic City.	Camden.	Atlantic City.	55.5	0:57:00	58.42	11	701,450	4-4-2	13, 22 x26	84½	78,600	141,000	6-26-'96
7- 3-'96	C., M. & St. P.	Forest Glen.	Nat. Ave.	74.0	1:22:00	54.2	13	974,390	2-4-2	13, 22 x26	..	71,600	140,700	1-22-'97
1-21-'96	S. & R.	Weldon.	Shops.	76.8	1:12:30	63.56	3	....	4-4-0	19x24	68	75,000	118,500	.....
2-15-'97	C., B. & Q.	Chicago.	Denver.	1,025	18:53:00	54.27	1	72,000	.....	....	.	...	....	2-26-'97
3-11-'97	Char. & Sav.	Cent. Junc.	Ashley J.	102	1:40:00	61.02	..	....	4-4-0	17x24	64	57,000	90,000	4- 2-'97
4- 9-'97	Atlantic Coast L.	Florence, S.C.	Rocky Mt.	172.2	3:00:00	57.70	5	....	4-4-2	19x24	72	76,000	129,620	.....
4-21-'97	Lehigh V.	Alpine.	Geneva Junc.	44	0:33:00	80.0	4	....	4-4-0	....	..	....	....	.....
7-14-'97	Atl. City (P. & R.)	Camden.	Atlantic City.	55.5	0:46:30	71.60	5	320,300	4-4-2	13, 22 x26	84	78,000	143,000	7- 9-'97
7-16-'97	P., Ft. W. & C.	G. R. & I. Jc.	Colehour.	132.5	2:15:00	58.8	6	628,587	4-4-0	18x24	68	65,400	103,600	8-27-'97
8- 3-'97	Union Pacific.	Evanston.	Omaha.	955.2	23:55:00	39.93	3	264,755	4-4-0	19x24	69	81,000	119,600	10-22-'97
8- 3-'97	Union Pacific.	N. Platte.	Omaha.	291.0	5:35:00	52.1	3							
11-29-'97	Union Pacific.	Cheyenne.	Council Bluffs.	519.0	9:19:00	55.7	..	....	.....	....	..	....	....	12-17-'97
12- 4-'97	Union Pacific.	Sydney.	Omaha.	414.2	7:12:00	57.5	3 3 6	276,000 276,000 546,000	4-6-0 4-4-0 4-6-0	20x24 19x24 20x24	69 69 69	103,000 81,000 103,000	131,200 119,600 131,200	12-17-'97
2-13-'98	Erie.	Jersey City.	Buffalo.	423.0	7:30:00	56.4	3	....	.....	....	..	....	....	2-18-'98
8-20-'98	Atlantic City.	Camden.	Atlantic City.	55.5	0:46:45	71.2	7	437,700	4-4-2	13, 22 x26	84	76,400 est.	143,000 est.	.....
1- 2-'99	Chic., B. & Q.	Omaha.	Chicago.	500.2	8:43:00	57.38	..	....	.....	....	..	....	....	.....
4-23-'99	Chic., B. & Q.	Clyde.	Burlington.	197.3	3:04:00	64.33	4	378,000	2-6-0	19x24	69	106,500	125,000	5- 5-'99
7- 9-'99	Del., L. & W.	Bath.	East Buffalo.	104.0	1:30:00	69.30	..	....	.....	....	..	....	....	8- 4-'99
7-19-'99	Vandalia.	Clayton.	Transfer.	18.0	0:14:00	77.00	8	....	4-4-0	20x26	75	85,800	....	7-28-'99
7-22-'99	Atlantic City.	Camden.	Atlantic City.	55.5	0:51:15	65.00	8	....	.....	....	..	....	....	.....
7-31-'99	W. J. & S. (Penn.)	Camden.	Atlantic City.	58.3	0:50:30	69.30	8	....	.....	21.5x26	80	....	....	8-11-'99
10- 7-'99	Penn. W. Pittsbg..	Ft. Wayne.	Chicago.	148.3	2:50:00	52.30	6	688,857	.....	19x24	68	112,550	138,000	11-10-'99
10-14-'99	Wabash.	Tilton.	Granite City.	176.6	2:47:30	63.30	4	360,000	4-4-2	19x26	73	83,450	157,900	.....
11-22-'99	L. S. & M. S.	Buffalo.	Cleveland.	183.0	3:25:00	....	8	....	4-6-0	20x28	80	133,000	....	12- 1-'99
3-27-'00	Atch., T. & S. F.	Los Angeles.	Chicago.	2,236	58:00:00	38.55	2	148,900	....	....	..	....	....	4-13-'00
4-30-'00	Chic., B. & Q.	Burlington.	Chicago.	205.8	3:23:00	60.80	4	....	2-6-0	19x24	69	106,500	125,000	5-11-'00
7- 9-'00	N. Y. C. & H. R.	Rochester.	Syracuse.	80.7	1:25:00	56.70	7	689,400	4-4-0	19x24	84	84,000	124,000	.....
7- 4-'00	Atlantic City.	Camden.	Atlantic City.	55.5	0:44:15	75.20	4	364,000	4-4-2	15, 25 x24	84	89,200	173,600	11- 2-'00
8-16-'00	Atlantic City.	Camden.	Atlantic City.	55.5	0:44:15	75.20	5	456,000	4-4-2					
9-30-'00	Penn. Lines.	Ft. Wayne.	Clarke J.	126.0	2:38:00	47.90	9	....	.....	....	..	....	....	10-26-'00
12-21-'00	Burlington.	Omaha.	Billings.	892.6	16:23:00	54.40	1	....	.....	....	..	....	....	1- 4-'01
3- 1-'01	Sav., F. & W.	M. P. 69.	M. P. 74.	4.8	0:02:40	107.90	3	....	4-6-0	19x28	73	108,000	146,000	3-22-'01
9- 5-'01	Mich. Cent.	Susp. Bridge.	Windsor.	229.0	3:40:00	62.45	5	430,000	4-4-2	21x26	79	95,000	176,000	11-22-'01
2- 9-'02	N. Y., N. H. & H.	Harlem R.	Boston.	228.0	4:12:00	54.30	.	....	.....	....	..	....	....	2-21-'02
3-24-'02	Penn.	Philadelphia.	Jersey City.	89.8	1:19:00	68.17	2	....	.....	....	..	....	....	3-28-'02
3-24-'02	Burlington.	Eckley.	Wray.	14.8	0:09:00	98.66	9	....	4-6-0	19x26	72	....	156,600	4-25-'02
6-21-'02	Penn.	Harrisburg	Altoona.	131.4	2:10:00	60.70	3	280,824	4-4-0	18½x26	80	93,100	134,500	7- 4-'02
5-25-'03	L. S. & M. S.	Toledo.	Elkhart.	133.4	1:54:00	70.20	4	500,000	4-4-0	20x28	80	133,000	172,000	5-29-'03
6-19-'03	L. & N. W.	London.	Carlisle.	299.2	5:58:00	50.14	12	Note.	Note.	....	..	....	....	7-17-'03
8- 8-'03	A. T. & S. F.	Chicago.	Los Angeles.	2,267.0	52:49:00	42.80	2	....	....	....	..	....	....	8-14-'03
4-27-'04	Mich. Cent.	Niagara Falls.	Windsor.	225.7	3:18:00	68.38	4	334,900	4-4-2	21x26	79	95,000	176,000	5-20-'04
6- 9-'04	Gt. Western.	Plymouth.	London.	246.8	3:46:48	65.30	.	300.000	4-2-2	Note.	92	....	....	6- 3-'04
7-20-'04	Atlantic City.	Camden.	Atlantic City.	55.5	0:43:00	77.40	5	....	.....	....	..	....	....	8- 5-'04
5-14-'05	Atlantic City.	Atlantic City.	Camden.	55.5	0:42:33	78.26	5	460,000	4-4-2	21x24	..	99,000	....	12-15-'05
6- 8-'05	Penn.	E. Tolleston.	Donaldson.	50.0	0:38:00	79.00	3	....	4-4-2	20½x26	..	109,000	....	12-15-'05
6-13-'05	L. S. & M. S.	Chicago.	Buffalo.	525.0	7:33:00	69.53	3	350,000	.....	....	..	....	....	12-15-'05
0- 0-'05	N. Y. C. L. S. & M. S.	New York.	Chicago.	964.0	18:00:00	53.55	..	Note.	.....	.....	..	....	...	12-15-'05
7- 9-'05	A. T. & S. F.	Los Angeles.	Chicago.	2,246.0	44:54:00	50.00	3	338,000	.....	....	..	....	..	12-15-'05
10-23-'05	Southern Pac. Union Pac. Chic. & No. West. L. S. & M. S. Erie.	Oakland.	Jersey City.	3,239.0	73:12:00	44.30	..	....	.....	....	..	....	....	12-15-'05
10-24-'05	Penn.	Crestline.	Ft. Wayne.	131.4	1:41:20	77.81	4	520,000	....	....	..	....	...	12-15-'05
10-24-'05	Penn.	Crestline.	Clarke J	257.4	3:27:20	74.55								
11- 3-'05	Penn.	Harrisburg.	Chicago.	717.0	12:49:00	56.00	3	....	4-4-2	....	..	....	Note.	12-15-'05
5- 5-'06	Southern Pac. Union Pac. Chic. & N. W. L. S. & Mich So. N. Y. Cent.	Oakland.	New York.	3,255.0	71:27:00	45.60	3	Note.	...	....	.	.	..	5-18-'06
6-19-'06	Atlantic City.	Camden.	Atlantic City.	55.5	0:43:30	76.70	6	Note.	4-4-2	20x27	86	110,000	210,000	6-22-'06

*Date reported in RAILROAD GAZETTE.

records for given distances, no account being taken of loads or grades.

Best Recorded Speeds of Steam Locomotives.

	Miles			
	Distance.	Rate per hr.	Date.	Road.
1.	3.255	45.60	May 5, 1906.	Various.
2.	2,246	50.00	July 9, 1905.	Atchison, Topeka & Santa Fe.
3.	1,025	54.27	Feb. 15, 1897.	Chicago, Burlington & Quincy.
4.	717	56.00	Nov. 3, 1905.	Pennsylvania.
5.	525	69.53	June 13, 1905.	Lake Shore & Michigan South'n.
6.	257	74.55	Oct. 24, 1905.	Pennsylvania.
7.	131	77.81	Oct. 24, 1905.	Pennsylvania.
8.	55.5	78.26	May 14, 1905.	Atlantic City.
9.	50	79.00	June 8, 1905.	Pennsylvania.
10.	15	98.66	Mar. 24, 1902.	Chicago, Burlington & Quincy.
11.	4.8	107.90	Mar. 1, 1901.	Savannah, Florida & W.

The table below shows the schedule speeds of ten notable regular trains now running on American railroads. The fast trains between New York and Philadelphia, which for years were notable as the fastest trains in America, are now outclassed by the New York-Chicago trains. The Pennsylvania's Chicago train is regularly scheduled from Jersey City to North Philadelphia, 84 miles, in 83 minutes.

Scheduled Speeds, American Railroads, August, 1906.

	From.	To.	Railroad.	Distance, miles.	Time, hrs.min.	Speed, miles pr hour.
1.	Oakland	Chicago.	S. P., U. P., C. & N.-W.	2,274	67:30	33.7
2.	Los Angeles	Chicago.	Atch., Top. & S. F.	2,267	66:15	34.2
3.	New York	Chicago.	N. Y. C. & H. R. and L. S. & M. S.	964	18:00	53.5
4.	Jersey City	Chicago.	Pennsylvania.	905	17:46	50.9
5.	New York	Buffalo.	New York Central.	440	8:15	53.3
6.	New York	Boston.	N. Y., N. H. & Hart.	232	5:00	46.4
7.	Washington	Jersey City.	Pennsylvania.	224	4:46	47.0
8.	Jersey City	Washington.	C. of N. J., P. & R., Balt. & Ohio.	226	4:48	47.1
9.	Atlantic City	Camden.	W. Jersey & Seashore.	59.0	0:52	68.1
10.	Camden	Atlantic City.	Atlantic City.	55.5	0:50	66.6

HARRISBURG TO ALTOONA IN TWO HOURS THREE MINUTES.

One of the records in the table of fast runs published in this issue of the *Railroad Gazette* has already been broken—that from Harrisburg to Altoona, over the Middle division of the Pennsylvania Railroad. On August 24, 1906, train No. 11, consisting of an engine and four cars, was run from Harrisburg to Altoona (131.4 miles) in 123 minutes, or at the rate of 64.1 miles an hour. The engine was No. 1,080, of the Atlantic type, (4-4-2) Pennsylvania Railroad class E-2; cylinders, 20½ in. x 26 in.; diameter of driving wheels, 80 in.; weight on drivers, 109,000 lbs.; weight of engine in working order, 176,600 lbs. The weight of the four cars and the mail bags contained in them is estimated at 375,750 lbs., and this with the weight of the tender, loaded, (132,500 lbs.) makes the total estimated weight of the train 684,850 lbs.

Bridge Disaster at Atlantic City.

By the derailment of a passenger train on the West Jersey & Sea Shore Railroad at the drawbridge about one mile from the terminus of the road at Atlantic City, N. J., last Sunday afternoon, 52 or more of the 80 passengers on the train were killed, most of them being drowned, and nearly all of the rest were injured. The number of killed is not yet accurately known, as four or more persons are missing. The motorman of the train was killed, but the conductor and the other trainman escaped. The train was No. 1,065, from Camden to Atlantic City, over the electric line, by way of Newfield, and consisted of three passenger cars, the foremost being the motor car. While running at ordinary speed, probably between 20 and 40 miles an hour, one of the cars, probably the leading car, jumped the track at or near the entrance to the draw span of the bridge and the whole train immediately plunged off the side of the bridge into the water of the "Thoroughfare." The first two cars were quickly submerged and nearly or quite every person in them appears to have been drowned. The last car rested on the others, with its rear end leaning against the cribbing adjacent to the center of the drawbridge. The rear brakeman succeeded in working the pneumatic apparatus so as to open the rear door of this car before it had fallen off the bridge, and through this opening some of the passengers escaped.

The cause of the derailment is obscure. The first reports had it that the first right-hand rail on the draw span was out of position, but there appears to be no evidence of this. This rail was found displaced and somewhat bent after the accident, but the flagman of the bridge was within a few feet of it just before the train came along and he noticed nothing wrong. There was nothing to distract his attention and he gave the usual all-right signal with a flag. The trucks of the first two cars were not raised from the bottom of the river until Tuesday. They were then carefully examined, and slight abrasions were found on the wheels of the second car, but none on those of the first car. It seems likely, therefore, that the displacement of the rail was caused by the second car and not the first, although the evidence seems to be tolerably clear that the leading car was the first to run off the track. The evidence concerning the speed of the train thus far published is so conflicting as to be worthless.

The bridge is a double-track trestle several hundred feet long with a steel deck span about 75 ft. long. The draw span rests on a pneumatic cylinder, by which the whole span is lifted about 8 in., when it has to be turned to permit the passage of a vessel. The bridge is new, having been built during the past year in connection with the electrification of the line. At the ends of the draw the rails drop into troughs of angle iron on the fixed span, when the bridge settles into place. The newspapers have printed many statements to the effect that the rail at the point of derailment was not in its proper place in the trough, but no coherent evidence is produced to this effect.

The tracks are suitably equipped with mechanical interlocking signals, and the employment of a flagman appears to have been designed as an additional safeguard. The photographs published in the newspapers indicate that the bridge has an outside timber guard rail about 8 in. x 10 in., but no inside guard rails.

The Pennsylvania Railroad, which controls the West Jersey & Sea Shore, issued a statement on Monday to the effect that the cause had not been discovered; that there was no defect in either the drawbridge or its mechanism to cause the derailment, and that the bridge in all respects is of the most approved modern type. The interlocking signals indicated clear for the train, and this they could not have done if the rails had not been exactly in place. On Tuesday another statment was issued as follows:

"After thorough investigation the Pennsylvania Railroad officials have found no explanation of the accident on the Thoroughfare Bridge Sunday. All possible theories advanced were traced to the bottom, but the cause of the derailment is no better known than it was at first.

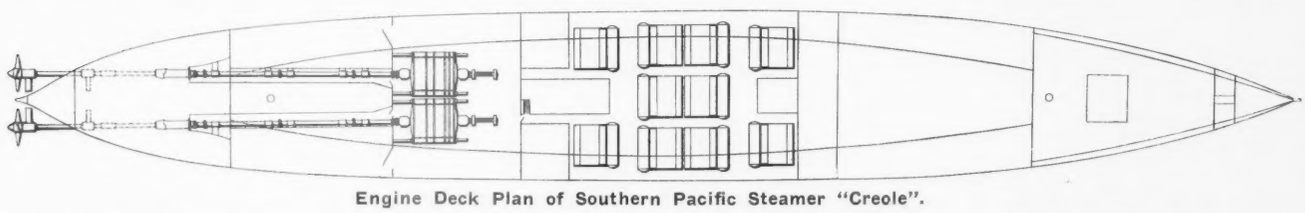
"It was hoped that the trucks of the cars when raised out of the water would afford some clue, but they did not. They were carefully examined by officials of the company, including General Manager Atterbury, Chief Electrical Engineer George Gibbs, General Superintendent of Motive Power A. W. Gibbs, and others. The trucks were intact and there was nothing about either the wheels or the other parts to throw any light on the matter.

"Thorough examination of the bridge and the mechanism used in moving the draw showed that these were in perfect shape. All evidence shows that the rails were exactly in place. Aside from the fact that the interlocking signal could not have shown a clear track otherwise, the bridge tender is positive that the rails on the draw and those on the stationary part of the bridge fitted precisely.

"When the train approached he was standing within three or four feet of the point where the rails joined, and he looked at the track to see that it was all right. The officials examined the bridge structure and found it strong and safe in every respect."

New Southern Pacific Steamer "Creole."

The "Creole," recently launched by the Fore River Shipbuilding Company, is the first ocean going, twin screw, turbine steamship built in this country. Her gross tonnage is about 7,000 tons; displacement, 10,600 tons, and dead weight carrying capacity, 4,500 gross tons. She is 440 ft. long over all and 416 ft. long on the water line. The beam is 53 ft. and depth 37 ft. from the upper deck. She will draw when loaded 26 ft. of water.



Engine Deck Plan of Southern Pacific Steamer "Creole".

The accompanying drawing shows the boilers and turbines. There are ten Babcock & Wilcox water tube boilers supplying steam to the two 10-ft. reversing Curtis turbines which develop, together, 8,000 brake horse-power. It is estimated that these engines can drive the ship 18 knots per hour, but she is designed for only 16 knots while at sea.

The boat has five decks, and water tight bulkheads divide the hull into four cargo holds which have a total capacity of 335,000 cu. ft. The coal bunkers hold 1,700 tons of coal and the fresh water tanks carry about 800 tons of water. The lower hull is divided into 22 water tight compartments. The boat is built with a double bottom. The "Creole" will carry 152 first class passengers, 58 second class passengers and 258 steerage passengers. She will be fitted with steam steering gear, steam winches, steam windlass and steam capstans. Her other equipment includes a Linde refrigerator plant, an electric light plant, a Brown telemotor and a Clayton fire extinguisher and disinfecting machine. This apparatus blows sulphur fumes through pipes into all parts of the ship where freight or coal is carried.

GENERAL NEWS SECTION

NOTES.

The Baltimore & Ohio announces the reduction of all passenger fares on the Philadelphia division Nov. 1 to the basis of 2½ cents a mile.

The new steel steamer "Snyder" arrived at Buffalo from Fort William Oct. 27 with 380,262 bushels of wheat, the largest cargo ever brought to that port.

It is announced in Chicago that the Pennsylvania and the Erie have agreed not to sell their $20 mileage ticket, good for bearer, in the territory west of Pittsburg and Greenville, Pa.

The Enterprise Transportation Company, running steamboats between New York and Fall River, announces that it is to put on an additional line, to run between New York and Providence.

It is announced that the Boston & Maine will about January 1st make a general reduction of passenger rates in Massachusetts to 2 cents a mile; and on the lines farther north, a reduction of 5 mills from the present rates, some of which are more than 2½ cents.

Fifty seven conductors on the Montreal, Portland, Toronto and Chicago divisions of the Grand Trunk have been discharged. No reason is given officially, but the newspapers say that one conductor was found to be worth $100,000 and another to be the owner of six grocery stores.

According to press despatches, the Pullman Company is not going to publish, post or file its tariffs or send them to the Interstate Commerce Commission. The company takes the ground that it is not a common carrier; that its services are the same as those performed by hotels.

Chicago newspapers report that the railroads of Illinois are revising their freight tariffs, to make them comply with the long and short haul law of that state, which it is said has always been ignored. Now, it is said, the railroads are threatened with a large number of suits for damages.

Officials of the Atchison, Topeka & Santa Fe at San Francisco deny the press reports that more than $10,000 has been remitted by persons to whom the company gave free transportation out of San Francisco at the time of the disaster of April 18. They say that not even the price of a single fare has yet been received.

The press agent of the Baltimore & Ohio announces that the superintendent of motive power of that road has issued new instructions to enginemen and firemen covering the firing of locomotives. The work must be done with the utmost care, and the emission of black smoke from the stack must be reduced to the minimum.

Press despatches of Oct. 26 state that J. M. Stoudt, Superintendent of Interlocking of the C., C., C. & St. L., was killed, and M. F. Potter, Supervisor of Bridges and Buildings at Springfield, Ohio, was fatally injured near Milford, Ohio, by a collision between the second section of a passenger train and the motor car on which they were inspecting bridges.

The Atchison, Topeka & Santa Fe has notified telegraph operators who send and receive messages for the Western Union Telegraph Company, that they are to be paid 10 per cent. of the revenue derived from this commercial business. This, with an advance of pay which was made about two months ago, will increase the payrolls of operators on the road about $65,000.

An Association of Railroad Industrial Agents has been formed to meet twice a year. The next meeting is to be held at Chicago on the second Tuesday in January. W. H. Manss, of the Chicago, Burlington & Quincy, is President; W. E. Moyer, of the Delaware & Hudson, Vice-President; R. E. Wilson, of the Atchison, Topeka & Santa Fe, Secretary, and D. E. King, of the Missouri Pacific, Treasurer.

J. N. Seale, Superintendent of Transportation of the Southern Railway, who has been convicted a second time of violation of the law of the state of Georgia, prohibiting the running of freight trains on Sunday, has appealed to the Supreme Court of the state, on the ground that the law is a restraint on Interstate Commerce, and also that the state has no right to designate a particular day as the Sabbath.

At Omaha last week Interstate Commerce Commissioners Lane and Clark heard testimony concerning the conduct of the grain trade in Nebraska. The manager of the Farmers' Grain Company, composed of 300 farmers along the line of the Union Pacific, said that formerly his company had had difficulty in securing suitable facilities for loading grain into cars, but later had been treated with perfect fairness.

In a suit filed at Des Moines, Iowa, last week by the Agar Packing Company against the Chicago, Rock Island & Pacific, it is alleged that other shippers, by secret agreement, have been able to ship hogs from various points to Valley Junction, three miles west of Des Moines, without the payment of any freight whatever; this on condition that the hogs should be re-shipped over the Rock Island road to Chicago.

According to a Paris newspaper a competent authority estimates that the yearly cost to the railroads of France of giving their employees a day off each week will be from $6,000,000 to $8,000,000. It will be remembered that the Sunday rest law, recently passed, exempted the railroads from its provisions, the intention being, apparently, to take up the needs of railroad employees at a later time; but the railroads conferred with each other and agreed to grant the seventh day rest voluntarily.

Governor Franz of Oklahoma has begun proceedings against the railroads doing business in that territory to compel them to observe the law. Suits are being brought in every county, and special attorneys are being employed to assist the attorney general in the prosecution. The roads against which offenses are being charged include the Missouri, Kansas & Texas, the St. Louis & San Francisco, the Rock Island and the Atchison, Topeka & Santa Fe. The roads are accused of charging higher rates than those set forth in their original charters; of operating as members of a combination to fix the price of the various commodities carried by them; and of combining to charge a fixed rate on corn, wheat and other crops for local distance haul and not for export trade. On shipments of export grain the roads are charged with discriminating against Oklahoma and in favor of Kansas and other southwestern states. It is alleged, for example, that the roads charge 5 cents per 100 lbs. less for hauling corn from Nebraska points to Galveston than the rate charged for the same service from Enid, Oklahoma. It further is charged that grain can be shipped from Kansas City to Galveston for 2 cents per 100 lbs. less than it can be shipped from Enid.

A Year's Rate Reductions on the Great Northern.

The annual report of the Great Northern issued October 31st sums up the rate reductions made during the past year as follows:

"The report for last year referred to a voluntary reduction in grain rates effective Sept. 1, 1905. This reduction amounted to about $750,000 for the nine months ended June 30, 1906.

"The following changes in rates were made during the year or were announced since the close of the fiscal year:

"Distributing rates were put into effect from Sauk Centre, Minn., July 1, 1905, and from Thief River Falls, Minn., on Sept. 1, 1905. A new distance tariff was put into effect in Montana, Aug. 15, 1906, reducing the rates named in the former distance tariff by about 10 per cent. On Aug. 15, 1906, new class rates were made from Eastern terminals to Montana points, which were about 10 per cent. lower than former rates. Sept. 1, 1906, rates on grain from stations in Minnesota, North and South Dakota, Iowa and Nebraska to Eastern terminals were reduced something more than 10 per cent. Sept. 10, 1906, class rates from far Western points to Montana points were reduced about 10 per cent. Oct. 22, 1906, rates on hard and soft coal from Duluth, Minn.; Superior, Wis.; St. Paul, Minn., and Minneapolis, Minn., to stations in Minnesota, North and South Dakota, Iowa and Nebraska will be reduced from 5 cents to $1 per ton. The greater reduction is made on soft coal, which is more largely used."

Applied Science in Kentucky.

A press despatch from Louisville, Ky., says that, on October 28, rival track laying gangs of the Louisville & Nashville and of the Louisville & Eastern met at Beards, 20 miles east of Louisville. At this point 100 Louisville & Eastern men attempted to lay track for their electric road over the Louisville & Nashville tracks; when the work was partly finished, 300 L. & N. men appeared and started tearing up the rails. The contestants first tried to settle the dispute with picks, shovels and fists, but the Louisville & Eastern people soon became dissatisfied with these crude methods and connected the rails they had laid with a charged trolley wire. The "Ellen N." men were at the time at work on the rails with crowbars * * * They were resuscitated just in time to greet the county officers, who solved the difficulty by arresting two dozen men from each side.

How the Pennsylvania Declares Its Dividend.

In view of the criticism of the dividend declarations in August of the Union Pacific and Southern Pacific, the following official statement of the way in which the Pennsylvania Railroad declares its dividends is of interest:

For many years it has been the fixed policy of the road for the directors to refuse to discuss the question of the dividend until the statements and earnings and expenses for the preceding six months have been completed and are ready for submission to the Board.

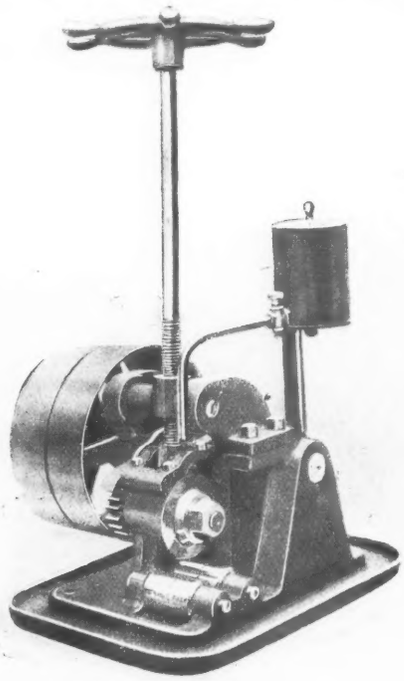
When these figures have been made up, meetings of the Finance Committee and of the Board are called. The former meets at 11 o'clock, goes carefully over the statements, and determines upon its recommendation to the Board as to the rate of the dividend to be paid, based upon the earnings of the previous six months. This committee continues in session until 12 o'clock, when, without leaving the room, the members appear before the Board of Directors, which meets at that hour. The report is then considered and the necessary action is taken by the Board in declaring the dividend. The announcement is given to the public immediately after the adjournment of the Board.

Sale of the Mallory Line to C. W. Morse.

The Mallory Line, which operates 11 steamers between Galveston, Tex., and New York, as well as between points in Georgia and Florida and between Galveston and Mobile, has been sold to C. W. Morse, who controls the Clyde Line, the Hudson River Navigation Co., the Citizens Steamboat Co., of Troy, the Metropolitan Line and the Eastern Steamship Company. These companies own, altogether, about 50 steamboats.

A New Rolling Pipe Cutter.

An improved design of pipe and tube cutter is shown herewith. The cutter shaft is driven direct from the driving shaft by cut gears and the cutter is raised or lowered by a screw working in a steel nut. The rollers are of large diameter, which reduces the speed, and they run on hardened steel pins. The cutter



A New Rolling Pipe Cutter.

disc is made of the best tool steel, carefully tempered, and is stiffened by a pair of steel flanges. An oil tank and pan are provided so that oil may be used if desired. The cutters are made in two sizes, No. 1 cutting from ¼ in. to 2 in., and No. 2 cutting from 1 in. to 4 in. They are made by the Bignall & Keeler Manufacturing Co., Edwardsville, Ill.

Ventilation of New York Subway.

The New York City Rapid Transit Commission is so well satisfied with the ventilating and cooling apparatus which has been put in at the Brooklyn Bridge station that it is proposed to provide the same improvement at a number of other stations before next summer. In the section between 33d and 42d streets, where the line is far below the surface and where the northbound tracks are in a separate tunnel from that carrying the southbound tracks, it is proposed to erect partitions with a view to securing effective ventilation by the movement of trains.

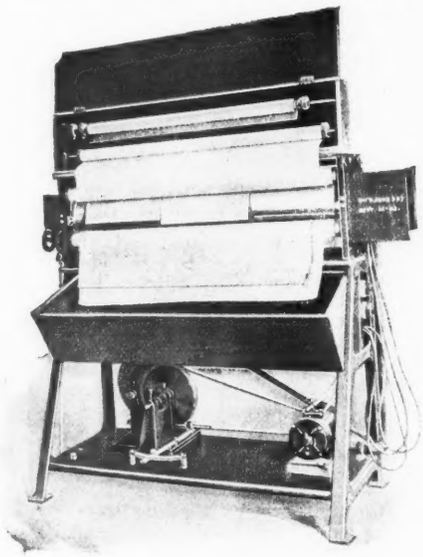
Plans are being made for the elimination of the grade crossing at the junction north of 96th street.

Ireland's International Exhibition.

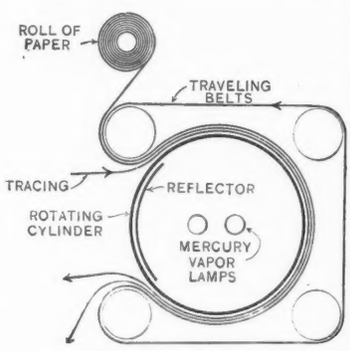
Ireland is to have an International Exhibition from May to October, 1907. The Machinery Building is already finished and all the buildings will be ready some months before the opening day. Exhibits will be classified in 19 sections, of which three are Engineering and Shipbuilding, Civil Engineering and Transportation, and Electricity. In the transportation and machinery departments there will be represented the Great Southern & Western Railway, the Dublin Wicklow & Wexford, the Great Western Railway of England, the White Star Line, the Cunard Steamship Co., the Royal Pacific Steam Packet Co., and the British Westinghouse Company. The exhibition is to be held in Herbert Park, in the residential quarter of Dublin about one and a half miles from the business center. The charge for space will be $1 per sq. ft., with a decreasing sliding scale for large exhibitors. Application for space and power should be made to the Secretary, Mr. James Shanks, Ballsbridge, Dublin, Ireland.

A New Blue Print Machine.

The accompanying illustrations are of the Everett-McAdam continuous electric blue printing machine. Its operation is clearly shown in the drawing, which is a cross section through the machine. A rotating glass cylinder lies within four rollers on which travels an endless belt, or rather a number of narrow belts. It has been found that these narrow belts give a more uniform bearing surface than a single broad one, so that the blue print is at all



Everett-McAdam Blue Printing Machine.



Cross Section.

points held firmly against the tracing. The tracings are fed between the outer surface of the cylinder and the blue print paper which unwinds from a roll at the top of the machine. Light is furnished inside of the cylinder by two mercury vapor lamps which give out only actinic rays. With this machine it is possible to make prints 5 ft. wide and of any length, but it is equally convenient to make a number of small prints on one long sheet of paper or on separate sheets. As the tracings go in and come out on the same side of the machine, the edge of the outgoing tracing may be started back into the machine before the trailing edge comes out; thus when a number of prints are to be made from one tracing no part of the blue print paper need be left blank; 12 prints from one six foot tracing have been made on a single sheet of paper 72 ft. long without stopping the machine. The machine requires a space 2 ft. x 5 ft., and is operated by a variable speed motor. It is built by the Revolute Machine Co., New York.

New Standard Steel Car Company Plant.

The Standard Steel Car Co., Butler, Pa., has let contracts to the McClintic-Marshall Construction Co., of Pittsburg, for a new car building plant at Hammond, Ind., to cost over $2,500,000. The site covers 320 acres. It is expected to have the new plant in operation by next spring.

The Traffic Club of New York.

The second regular meeting of the Traffic Club of New York was held on October 30 at the Hotel Astor, New York City. An increase of over 60 members was reported, bringing the total membership of the club, resident and non-resident, up to nearly 400.

Short speeches were made by representatives, each of the shipping, railroad and steamship interests, emphasizing the advantages to be obtained from co-operation and acquaintanceship afforded by the club for men in these different but inter-related lines of work. The evening was closed with refreshments and a vaudeville production.

Dr. Vauclain.

At the dedication exercises of the new engineering building of the University of Pennsylvania, the following remarks were made in presenting S. M. Vauclain, General Superintendent of the Baldwin Locomotive Works, as a candidate for the degree of Doctor of Science:

We ask you to confer the degree on Samuel Mathews Vauclain. A vigorous mind and body combined with vast energy and endurance have enabled him to accomplish the work of more than one man in a short span of years. Courageous and resourceful, asking nothing of his fellows which he would not willingly perform himself, he has become a leader of men and a guiding spirit in an enterprise which directly supports a hundred thousand souls. Prolific in invention, far seeing, equally capable of grasping great projects and their smallest details, he has in large measure helped to build up an industry which will be a monument to his sagacity for a generation yet to come. His contributions to the development of the steam locomotive have caused his name to be familiarly known wherever that useful pioneer of civilization has pushed its cheerful way.

1907 Conventions A. R. M. M. and M. C. B. Associations.

At a meeting of committees of the American Railway Master Mechanics' and Master Car Builders' Associations at the Manhattan Hotel, New York City, Oct. 29, it was decided to hold the 1907 conventions at Atlantic City, N. J. The Master Mechanics' Convention will be held June 12-14, and the Master Car Builders' Convention June 17-19. The Marlborough-Blenheim was selected for convention headquarters. The exhibits will be placed on the steel pier—the same as last year. The list of hotels and rates has not yet been completed, but it will be about the same as last year, except that a few hotels will be omitted, and some minor changes in rates are to be announced. Applications for exhibit space should be made to Bruce V. Crandall, Secretary of the Supply Men's Association, 510 Security Building, Chicago, Ill.

TRADE CATALOGUES.

London & North Western.—The New York office of the London & North Western (England) is distributing copies of a "Diamond Jubilee Album," which contains interesting illustrations and descriptions comparing the present cars, engines, tracks and buildings of the road with those of 1846. The same office also sends a copy of the August issue of the *Railway Magazine*, containing a full detailed and interesting description of the road. Many of the pictures are of scenes familiar to readers of L. & N. W. publications; but others are quite rare.

Hunting in the South.—This is the title of a pamphlet issued by the Passenger Department of the Southern Railway. It is not only a good advertisement, but is well arranged and will be valuable to sportsmen. Each of the states is taken up separately; the game laws are quoted and a table is given showing hotels, guides, kinds of game to be found and whether or not the land in the region is posted.

Ideal Power.—The October number of this magazine has articles on "Application of Electric Drills," with half-tone illustrations; "The Cook County Court House," being a reprint of an article describing the new court house being built in Chicago; "Air Motors for Locomotive Turntables"; "Lucas Hammer Die for Heading Staybolts," and other articles of interest in its field.

Steam Traps.—The Joseph Dixon Crucible Co., Jersey City, N. J., is distributing a reprint of an article on steam traps, by W. H. Wakeman, which originally appeared in *Graphite*. A number of types of traps are illustrated and described and their comparative values discussed.

Locomotives.—The Baldwin Locomotive Works has issued pamphlet No. 59 in its series of "Records of Recent Construction." This latest issue illustrates and describes, both in French and English, 14 locomotives of eight different types.

Catalogue of Technical Books.—Munn & Co., New York, publishers of the *Scientific American*, have issued their 1906-1907 catalogue of scientific and technical books published or sold by them. This catalogue may be had on request.

Manufacturing and Business.

The annual convention of the sales managers of the Westinghouse Electric & Mfg. Co. was held at the East Pittsburg Works last week.

R. J. Gross, Vice-President of the American Locomotive Co., has been elected also to the Board of Directors, succeeding E. C. Converse, resigned.

The Draper Manufacturing Co., Port Huron, Mich., has shipped three McGrath pneumatic turntable motors to the Swedish State Railways for turntables at Svarbo, Kiruna and Ricksgransen, Sweden.

It is reported that the United States Steel Corporation has bought 72,000 acres of timber lands, together with a saw-mill and other property, in Menominee County, Mich., from the Cedar River Land Company. It is said that this timber will supply the Menominee Range mines of the steel corporation for 30 years.

The Chicago Pneumatic Tool Co., Chicago, reports that up to October 25, the number of orders booked had exceeded by 47 per cent. orders for the first 25 days of October, 1905, being also an increase of 37 per cent. over September, 1906. The amount of business for the first nine months of the current year increased 27 per cent. over the corresponding period of 1905. The company had on its books at the close of 1905 more than 8,000 active customers, and has added over 1,500 to this list during the current year.

The Muscle Shoals Hydro-Electric Power Company has been incorporated in Alabama with $1,000,000 capital stock. The company proposes to dam the Tennessee river with two 60-ft. dams, one at the foot of Little Muscle Shoals and the other at Florence, Ala. Locks are to be built in the dams. It is expected that 100,000 h.p. will be developed, and a power house for generating electricity will be built below each dam. Transmission lines will be built to points within 100 miles, among them being Nashville, Huntsville, Decatur and Birmingham. The incorporators are: Frank S. Washburn, Nashville, Tenn.; Charles H. Baker, New York City; William H. Lindsey, Nashville, Tenn.; J. W. Worthington, Sheffield, Ala., and Massey Wilson, Montgomery, Ala.

Iron and Steel.

The Tremont & Gulf has ordered 1,000 tons for 1907 delivery, and the Chicago, Lake Shore & South Bend 8,300 tons.

The Delaware & Hudson is in the market for 15,000 tons of standard rails and for 6,000 tons of light sections for 1907 delivery.

The Detroit River Tunnel Company has ordered 6,000 tons of structural steel. The Northern Pacific has increased its order for bridge material to 17,000 tons.

The New York, New Haven & Hartford has ordered 35,000 tons of rails, and the Atlantic Coast Line 20,000 tons from the Pennsylvania Steel Co. for early delivery.

OBITUARY NOTICES.

J. W. Tedford, formerly General Freight Agent of the Gulf, Colorado & Santa Fe, died recently at Sharon, Pa.

J. P. Amsden, President of the Louisville & Atlantic, died of pneumonia at Versailles, Ky., on October 30. Mr. Amsden was 60 years old.

A. M. Hawkins, Superintendent of the Pamlico division of the Norfolk & Southern, died on October 19th. Mr. Hawkins had been on the N. & S. for 25 years.

George R. Knox, General Freight Agent of the Nashville, Chattanooga & St. Louis, died at Nashville, Tenn., on October 26th, being 62 years old. Mr. Knox had been on the N. C. & St. L. since 1860; he was appointed General Freight Agent in 1879.

James D. Yeomans, formerly a member of the Interstate Commerce Commission, died in Washington October 31 of a complication of diseases, at the age of 61. Mr. Yeomans was born in Wyoming County, New York, in 1845. He entered railroad service early in life, became General Superintendent of the Buffalo, New York & Philadelphia, was identified with other railroad interests, and later became General Superintendent of the Olean, Bradford & Warren. Subsequently he engaged in railroad building in New York, Pennsylvania and Michigan. Mr. Yeomans had private business interests in Washington, to which he devoted himself after his retirement from public.

F. T. Robertson, General Manager of the Montana Railroad, died recently at Kansas City, Mo. Mr. Robertson began railroad work as a rodman on the Northern Pacific in 1881. After graduating from the Missouri School of Mines, he served until 1897 as resident engineer on construction on the Union Pacific, Atchison, Topeka & Santa Fe, Northern Pacific, Missouri, Kansas & Texas, and Kansas City, Pittsburg & Gulf, now the Kansas City Southern. He was then appointed Assistant Engineer of Maintenance of Way on the K. C., P. & G., and later Engineer of Maintenance of Way of its Texas lines. After working on the Clearwater extension on the Northern Pacific, he was, in 1900, appointed Superintendent of the Montana Railroad; later in the same year he was made also Chief Engineer, and in 1904 was appointed General Superintendent

and Chief Engineer. From November, 1905, until his death he acted as General Manager and Chief Engineer.

MEETINGS AND ANNOUNCEMENTS.

(*For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page* 24.)

Franklin Institute.

At a stated meeting of the sections November 1 the subject for discussion was "The Direct Leakage of Steam Through Steam Valves," by J. V. Stanford, of the University of Pennsylvania.

Canadian Society of Civil Engineers.

At a meeting of the Mechanical Section of this society in Montreal Nov. 1 a lecture on "Dynamometer Car Experiments on the Boston & Maine" was given by H. O. Keay, illustrated by lantern slides.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Chicago, Rock Island & Pacific.—E. B. Pierce has been appointed Commerce Counsel of this road and of the St. Louis & San Francisco, with office at Chicago. Mr. Pierce will have charge of dealings with the Interstate Commerce Commission and the state railroad commissions.

St. Louis & San Francisco.—See Chicago, Rock Island & Pacific.

Operating Officers.

Atlanta & Birmingham Air Line.—J. M. Shea, trainmaster of the Seaboard Air Line at Richmond, Va., has been appointed Superintendent of the A. & B. Air Line, with office at Birmingham, Ala., succeeding L. B. Parsons, resigned.

Canadian Pacific.—G. E. Graham, Superintendent of Terminals at Winnipeg, Man., has been appointed Superintendent at Brandon, Man., succeeding J. J. Scully, transferred.

Central of Georgia.—R. J. Harlan, Assistant Superintendent of the St. Louis & San Francisco at Birmingham, Ala., has been appointed Superintendent of the Macon division of the Central of Georgia, with office at Macon, Ga.

Chicago, Indianapolis & Louisville.—See Detroit, Toledo & Ironton.

Detroit, Toledo & Ironton.—G. K. Lowell, General Superintendent of the Chicago, Indianapolis & Louisville, has been appointed General Manager of the D., T. & I.

New Orleans & Northwestern.—W. C. Morse, trainmaster of the Valley division, has been appointed Superintendent, with office at Ferriday, La., succeeding A. E. Wyatt, resigned.

Pennsylvania Lines West.—J. W. Coneys, Superintendent at Logansport, Ind., has been appointed Superintendent at Indianapolis, Ind., succeeding M. W. Mansfield, who has been made Assistant Chief Engineer. I. W. Geer, Superintendent of the Vandalia at Logansport, Ind., succeeds Mr. Coneys.

Pittsburg, Shawmut & Northern.—Herbert S. Wilgus, who was recently appointed Engineer of Maintenance of Way, was born in New York state in 1876 and graduated from Cornell in 1901. He began railroad work at once in an engineering corps of the C., C., C. & St. L. In the latter part of 1902 he was Assistant Engineer in charge of track elevation at Allegheny, Pa., on the Pittsburg, Fort Wayne & Chicago. During the next year he was in charge of the reconstruction of the Conway yards at Pittsburg, Pa., on the same road, and in September, 1903, was appointed Principal Assistant Engineer of the Brooklyn Heights Railroad; he was later made Engineer of Way and Structures and then Engineer of Surface Lines on this road. He left the last named position to go to the Pittsburg, Shawmut & Northern.

St. Louis & San Francisco.—See Central of Georgia.

Trinity & Brazos Valley.—H. S. Bottoms has been appointed Car Accountant.

Union Pacific.—W. H. Peterson, Acting Superintendent at Ellis, Kan., having resigned to go to another company, the office is abolished and the authority of A. T. Palmer, Assistant Superintendent at Kansas City, Mo., is extended over the Western district and branches. See Chicago, Rock Island & Pacific under Engineering and Rolling Stock officers.

Vandalia.—See Pennsylvania Lines West.

Traffic Officers.

Illinois Southern.—H. P. Radley has been appointed General Freight and Passenger Agent, with office at Chicago, Ill., succeeding A. N. East, resigned.

New York Central & Hudson River.—H. W. Henry, General Coal Agent, has resigned to go into other business.

Engineering and Rolling Stock Officers.

Chicago & North-Western.—W. C. Armstrong, Bridge Engineer of the Chicago, Rock Island & Pacific, has been appointed Terminal Engineer of the C. & N.-W., in charge of new passenger terminal work at Chicago.

Chicago, Rock Island & Pacific.—W. H. Peterson, Acting Superintendent of the Union Pacific at Ellis, Kan., has been appointed Bridge Engineer of the C., R. I. & P., succeeding W. C. Armstrong, resigned to go to another company. See Chicago & North-Western.

Detroit, Toledo & Ironton.—J. B. Ball, formerly Superintendent of Motive Power of the Toledo, St. Louis & Western, has been appointed Superintendent of Motive Power of the D., T. & I., with office at Jackson, Ohio.

Illinois Southern.—M. W. Fitzgerald has been appointed Master Mechanic, with office at Sparta, Ill., succeeding G. A. Gallagher, resigned to go to another company. See Southern Indiana.

New York Central Lines.—R. D. Smith, formerly Superintendent of Motive Power of the Chicago, Burlington & Quincy Lines West of the Missouri River, has been appointed Mechanical Expert of the New York Central Lines West of Buffalo, with office at Chicago.

Northern Pacific.—R. M. Crosby, superintendent of shops at South Tacoma, Wash., has been appointed General Master Mechanic at Tacoma, succeeding William Moir, promoted.

Pennsylvania Lines West.—M. W. Mansfield, Superintendent at Indianapolis, Ind., has been appointed Assistant Chief Engineer, with office at Pittsburg, Pa.

St. Louis, Iron Mountain & Southern.—W. L. Calvert has been appointed Master Mechanic at McGehee, Ark., succeeding R. G. Long, resigned.

Southern Indiana.—G. A. Gallagher, Master Mechanic of the Illinois Southern, has been appointed Master Mechanic of the Southern Indiana, with office at Bedford, Ind., succeeding W. C. Walsh, resigned.

Special Officers.

Wabash.—G. M. Hart, Inspector, Commissary Department, has been appointed Acting Superintendent of the Commissary Department, succeeding F. C. Roberts, resigned.

LOCOMOTIVE BUILDING.

The Pennsylvania has reserved space with the Baldwin Locomotive Works for over 100 locomotives. They will probably be heavy consolidation (2-8-0) type freight locomotives.

The Buffalo, Rochester & Pittsburg has ordered 14 simple consolidation (2-8-0) type locomotives from the American Locomotive Co., for June and July, 1907, delivery. General dimensions are as follows:

Weight on drivers	164,000 lbs.
Total weight	184,000 lbs.
Diameter of cylinders	21 in.
Stroke of pistons	28 "
Diameter of drivers	57 "
Type of boiler	Extended wagon-top
Working steam pressure	210 lbs.
Heating surface, total	2,862 sq. ft.
Tubes—number	354
" material	Charcoal iron
" outside diameter	2 in.
" length	14 ft. 6¾ "
Firebox, length	108 "
" width	74 "
Grate area	544 sq. ft.
Tank capacity	6,000 gals.
Coal capacity	12 tons

The Illinois Central has ordered for the Indianapolis Southern eight simple Consolidation (2-8-0) type locomotives from the American Locomotive Co., for March, 1907, delivery. The specifications are as follows:

General Dimensions.

Type of locomotive	Consolidation (2-8-0)
Weight, total	203,500 lbs.
Weight, on drivers	181,000 lbs.
Diameter of drivers	63 in.
Cylinders	22 in. x 30 in.
Boiler, type	Extended wagon-top
Working steam pressure	200 lbs.
Tubes, number	344
" material	Charcoal iron
" diameter	2 in.
" length	15 ft. 6 in.
Firebox length	107 in.
Firebox, width	67¼ in.
Grate area	50 sq. ft.
Total heating surface	2,946 sq. ft.
Tank capacity	7,000 gals.
Coal capacity	15 tons

The North Eastern Cuba Railroad Company has ordered two

60-ton Prairie (2-6-2) locomotives from the Baldwin Locomotive Works. The executive offices of the company are in New York City.

The Atchison, Topeka & Santa Fe has ordered 23 compound Atlantic (4-4-2) locomotives from the Baldwin Locomotive Works, for January and February, 1907, delivery. These locomotives are to be almost duplicates of the balanced Atlantic type engines which the company now has in service.

The Grand Rapids & Indiana, as reported in our issue of October 26, has ordered four simple 10-wheel (4-6-0) locomotives from the American Locomotive Co., for May, 1907, delivery. The specifications are as follows:

General Dimensions.

Type of locomotive	Ten-wheel
Weight, total	165,000 lbs.
Weight, on drivers	126,000 lbs.
Diameter of drivers	68 in.
Cylinders	20 in. x 26 in.
Boiler, type	Belpaire
" working steam pressure	200 lbs.
" number of tubes	330
" tubes, material	Wrought iron
" diameter of tubes	2 in.
" length of tubes	15 ft.
Firebox, length	102 in.
" width	65½ "
" material	Steel to Penn. R. R. requirements
" grate area	46 sq. ft.
Heating surface, total	2,600 sq. ft.
Tank capacity	6,000 gals.
Coal capacity	12 tons

Special Equipment.

Air brakes	Westinghouse American
Axles	Steel to Penn. R. R. requirements
Bell ringer	"Little Giant"
Boiler lagging	Keasbey & Mattison
Brake-beams	National-Hollow
Brake-shoes	Company standard
Couplers	Kelso
Headlights	Star
Injectors	Nathan and Simplex
Journal bearings	Phosphor bronze
Piston rod packings	United States
Valve rod packings	American Locomotive Co.
Safety valve	Kunkle
Sanding devices	Leach
Sight-feed lubricators	Nathan
Springs	Union Spring Co.
Steam gages	Crosby
Steam heat equipment	Company's standard
Tires, tender wheels	Schoen steel
Tires, driving and truck wheels	Standard
Wheel centers	Steel

The Delaware, Lackawanna & Western is in the market for five simple switching engines and ten simple ten-wheel (4-6-0) locomotives for May, 1907, delivery. Three of the ten-wheelers will have 73-in. drivers, a total heating surface of 3,521 sq. ft., and tubes 15 ft. 9 in. long; otherwise their general dimensions are the same as for the other ten-wheelers as given below:

General Dimensions.

	Switching.	Ten-wheel.
Weight on drivers	132,000 lbs.	154,000 lbs.
Weight, total	132,000 lbs.	201,000 lbs.
Diameter of cylinders	19 in.	22½ in.
Stroke of pistons	24 "	26 in.
Diameter of drivers	51 "	69 "
Type of boiler	Wire firebox	
Working steam pressure	180 lbs.	215 lbs.
Heating surface, total	1,863 sq. ft.	3,380 sq. ft.
Tubes, number	270	398
" material	Charcoal iron.	Charcoal iron.
" outside diameter	2 in.	2 in.
" length	12 ft.	15 ft. 3 in.
Firebox, length	8 ft. 6 in.	11 ft. 3 in.
" width	8 ft.	9 ft.
Grate area	68 sq. ft.	102½ sq. ft.
Tank capacity	3,300 gals.	6,500 gals.
Coal capacity	6 tons.	10 tons.

Special Equipment.

Air brakes	Westinghouse
Axles	Midvale
Bell ringer	Snow
Boiler lagging	Johns-Manville
Brake-beam, switching	Sterlingworth-Warden
Brake-beams, ten-wheelers	Westinghouse
Brake-shoes	American Brake-Shoe & Foundry Co.
Draft gear	Gould-Session
Headlights	Dressel
Injector	Hancock
Journal bearings	Magnus Metal Co.
Piston rod packings	United States
Valve rod packings	United States
Safety valve	Consolidated
Sanding devices	Leach
Sight-feed lubricators	Nathan
Springs	Railway Steel Spring Co.
Steam gages	Ashcroft
Steam heat equipment	Gold
Tires—Driving wheels	Midvale
" —truck wheels	Midvale
" —tender wheels	Midvale
Wheel centers, switching	Steel and cast iron
Wheel centers, ten-wheelers	Cast steel

CAR BUILDING.

The Vandalia, it is reported, has ordered from the Interstate Car Co. 100 hopper coal cars of 100,000 lbs. capacity.

The Maine Central has ordered 1,000 box cars from the Western Steel Car & Foundry Co. for January, 1907, delivery.

The Chesapeake & Ohio, as reported in our issue of October 19, has ordered 2,000 hopper cars from the Standard Steel Car Co.

The Western of Havana has ordered 10 passenger cars from the American Car & Foundry Co. L. J. Buckley & Co., New York, are the purchasing agents.

The Kanawha & West Virginia has ordered 244 gondolas of 80,000 lbs. capacity from the Hicks Locomotive & Car Works, deliveries to begin in December, 1906.

The St. Louis & San Francisco, as reported in our issue of October 26, has ordered 150 Rodger ballast cars of 80,000 lbs. capacity, and 250 Williamson ballast cars, all of which are to be built by the American Car & Foundry Co.

The Duluth & Iron Range has ordered 80 36-ft. flat and 20 box cars, all of 60,000 lbs. capacity, from the Western Steel Car & Foundry Co., for April, 1907, delivery. The box cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements. The special equipment for both includes:

Brake-beams	National-Hollow
Brake-shoes	Streeter
Brakes	Westinghouse
Draft rigging	Bryan
Journal boxes	McCord

The Boston & Maine has ordered from the Pressed Steel Car Co. 500 box cars of 60,000 lbs. capacity to be built by the Western Steel Car & Foundry Co. at Hegeswich, Ill., for June, 1907, delivery. These cars will weigh 32,700 lbs. and will measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, inside measurements, and 36 ft. 8¼ in. long, 9 ft. 7 in. wide and 13 ft. 11⅝ in. high, over all. Bodies and underframes will be of wood. The special equipment includes:

Axles	Hammered wrought iron
Bolsters	Pressed steel
Brake beams	Metal
Brake-shoes	Steel back, American Brake-Shoe & Fdy. Co.
Brakes	Westinghouse Automatic
Brasses	Magnus
Couplers	Gould
Door fastenings	Seal locks
Doors	Sheathing doors
Draft rigging	Miner tandem
Dust guards	Flexible
Paint	Company's standard
Roofs	Murphy
Springs	Crucible steel
Trucks	Fox pressed steel, pedestal type
Wheels, make of	Griffin

The Delaware, Lackawanna & Western is in the market for 500 double hopper bottom steel cars of 80,000 lbs. capacity and 200 gondola cars of 80,000 lbs. capacity, both for 1907 delivery. The hopper cars will weigh about 36,000 lbs. and will measure 33 ft. 6½ in. long, 10 ft. wide and 10 ft. 3⅜ in. high, over all, and 30 ft. ¼ in. long and 9 ft. 5⅝ in. wide, inside measurements. Bodies and underframes will be of steel. The gondolas will weigh about 42,000 lbs. and will measure 44 ft. 3¾ in. long, 9 ft. 11½ in. wide and 7 ft. 5⅜ in. high, over all, and 40 ft. long, 8 ft. 7 in. wide and 3 ft. high, inside measurements. Bodies will be of wood and underframes of steel. The special equipment for both includes:

Bolsters, body	Built-up type
Bolsters, truck	Simplex
Brake-shoes	Lappin steel back
Brakes	Westinghouse
Brasses	Magnus Metal Co.
Couplers	Gould
Doors	Dunham
Draft rigging	Miner tandem
Dust guards	Wooden
Journal boxes	M. C. B. malleable iron
Springs	Railway Steel Springs Co.
Trucks	Arch-bar Barber Roller Bearing

The Mexican Central, as reported in our issue of August 31, has ordered 750 40-ft. box cars of 80,000 lbs. capacity, 150 stock cars of 60,000 lbs. capacity, 100 flat cars of 80,000 lbs. capacity, and 180 tank cars of 9,800 gallons capacity from the Standard Steel Car Co., all for January to March, 1907, delivery. The company has also ordered 11 express and four combination baggage, mail and express cars from Barney & Smith, for November and December delivery. The stock cars will be 33 ft. 10 in. long, 8 ft. 7 in. wide and 7 ft. 4 in. high, inside measurements. The flat cars will be 34 ft. 10 in. long and 8 ft. 10 in. wide, over all. The tank cars will be 36 ft. 10 in. long, 7 ft. 2¾ in. wide and 12 ft. 1¼ in. high, over all. The express and combination cars will be 59 ft. ¼ in. long, 8 ft. 10¼ in. wide and 6 ft. 8 in. high, inside measurements. The special equipment for all includes:

Brake-beams	National-Hollow
Brake-shoes (for passenger cars)	Christie
Brakes	Westinghouse
Couplers (for freight cars)	Janney
Couplers (for passenger cars)	National
Draft rigging	Westinghouse friction
Journal boxes	Symington
Light (for passenger cars)	Pintsch gas
Paint (for freight cars)	Detroit graphite
Paint (for passenger cars)	Valentine and Detroit graphite
Trucks	Mexican Central standard
Vestibules (for passenger cars)	Pullman plain dummy

The Illinois Central has ordered 1,100 drop bottom gondolas of 100,000 lbs. capacity from the Cambria Steel Co., for delivery December 15, and 300 flat cars of 100,000 lbs. capacity from the Stan-

dard Steel Car Co. for February 15, 1907, delivery. Of the gondolas, 400 are for the Indianapolis Southern and 200 of the flat cars are also for the last named road.

RAILROAD STRUCTURES.

ATLANTA, GA.—The Southern has given contracts to the Oliver Sollitt Co., of Chicago, and work has been started on new car sheds. There is to be an incoming freight shed 700 ft. long, and one for outgoing freight 650 ft. long, both to be of brick and steel construction, two stories high, to be equipped with freight elevators. The company proposes on the completion of this work to put up a large office building, eight stories high, to cost $300,000.

BELLEFONTAINE, OHIO.—The Cleveland, Cincinnati, Chicago & St. Louis, it is said, will spend about $600,000 enlarging its shops at this place. The shops now give employment to about 500 men.

CLARKSVILLE, TENN.—The Louisville & Nashville is planning important changes in this city by which the grade of its track from Academy avenue to Eleventh street will be lowered. The location of the station will probably be changed.

CLINTON, IOWA.—The Chicago & North-Western has bought land 50 ft. x 578 ft. as a site for new shops.

FT. WAYNE, IND.—The Fort Wayne & Wabash Valley Traction Co. has bought land as a site for a passenger station.

HATTIESBURG, MISS.—The New Orleans & Northeastern is planning to put up a new passenger station, also a freight house here.

LINCOLN, ILL.—An ordinance has been introduced granting certain privileges to the Chicago & Alton and providing for the building of a new passenger station here to cost $25,000.

LOS ANGELES, CAL.—The Los Angeles Pacific Railroad Company is negotiating to buy the Masonic Temple Building, which is to be removed and the site used for a new passenger station.

MASON CITY, IOWA.—The Chicago, Milwaukee & St. Paul is making plans for enlarging its roundhouse at this division point; also at McGregor and at Sanborn.

MONTREAL, QUE.—The Canadian Pacific has plans ready for putting up a paint shop at its Angus shops to cost $70,000.

NORTH YAKIMA, WASH.—The new Northern Pacific freight house recently completed has been put in use. It is a brick building one story high, 50 ft. wide and 368 ft. long.

OTTAWA, ONT.—The Department of Railways and Canals is having plans prepared for a new steel bridge over the Rideau canal at Main street.

PADUCAH, KY.—The Nashville, Chattanooga & St. Louis has bought land at this place as a site for a large grain elevator to have a capacity of 150,000 bushels.

PHILADELPHIA, PA.—The Pennsylvania has asked bids for putting up an ice plant here.

QUEBEC, QUE.—The Dominion Government has decided to subsidize extensive docks and railroad terminals here in connection with the new bridge and the Grand Trunk Pacific Railway. These new docks will be extended over an area of four miles.

ST. CHARLES-DE-BELLECHASSE, QUE.—Bids are wanted by the Intercolonial Railway for construction of steel superstructure for the bridge over Boyer river.

VERA CRUZ, MEX.—Plans for the railroad and port terminals on which work has already been commenced at this place will shortly be completed by Rudolf Wiesner, of Mexico City. The organization of the Vera Cruz Terminal Company has already been completed.

VICTORIA, B. C.—Estimates for bridge work on the Esquimalt & Nanaimo, amounting to $132,000, have been made. The work includes the replacing of seven wooden structures with steel structures.

WINNIPEG, MAN.—The Civic Bridge Committee has passed a resolution recommending the securing of legislation to provide for a steel bridge at McDermott avenue. An agreement has been reached between the city council and the Canadian Northern by which the latter is to build a subway at Pembina street.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA GREAT SOUTHERN.—Plans are being made by this company to build a line from Wauhatchie, Tenn., to a connection near Lookout tunnel on the line now under construction by the Southern from Stevenson, Ala., to Chattanooga.

ALABAMA, TENNESSEE & NORTHERN.—This company, which is the successor of the Carrollton Short Line, operating 21 miles of road from Reform, Ala., on the Montgomery division of the Mobile & Ohio, south to Aliceville, has issued bonds to secure funds for extending the road 29 miles south from Aliceville. The work includes a steel bridge over the Tombigbee river at a cost of about $40,000.

AMERICAN ELECTRIC.—An officer writes that work will shortly be started on this proposed line projected to run from Davenport, Iowa, west across Iowa to Council Bluffs. The first section from Des Moines west to Greenfield, 65 miles, is to be built this year. Contracts are to be let early next spring for the Muscatine division. Some of the work will be heavy, and will include seven steel bridges and nine trestles. The road will be laid with 60-lb. rails. (Oct. 26, p. 113.)

BALTIMORE & OHIO.—Under the name of the Patapsco & Susquehanna, this company, it is said, has commenced the construction of a line from its main line near Gorsuch station, in Carroll County, Md., northeast to a point near Sewell station, on the Philadelphia line, about 40 miles. The new line, which will have light grades, is to be used as a cut-off for east and westbound freight to avoid passing through Baltimore, where trains must either ferry across the Patapsco river or run through the tunnel. It also shortens the distance about 13½ miles.

BIG CREEK & TRINITY VALLEY.—Incorporation has been asked for by a company under this name in Texas with a capital of $10,000. The incorporators include J. H. Steele, I. H. Kemper, M. O. Kopperl and others, of Galveston, and S. T. Swinford and B. D. Brown, of Houston. They propose to build a line from Big Creek, in Liberty County, to Egypt, in San Jacinto County, about 10 miles.

CHESAPEAKE & OHIO.—At the recent annual meeting of this company the Board of Directors was authorized to complete the construction of the Potts Creek branch, a distance of 25 miles, for which $1,000,000 bonds will be issued.

CHICAGO & NORTH-WESTERN.—This company announces that its new line from Manitowoc, Wis., northwest to Green Bay, 37.3 miles, has been completed; and it was put in operation Oct. 21. (Aug. 10, p. 38.)

This company, in addition to the extension which it is building from Eland, Wis., on the Ashland line, east to the Peninsula line, near Green Bay, has practically completed a new cut-off from the latter place northwest to Gillett, giving Milwaukee direct connection with the new line.

COLORADO & NORTHERN.—Under this name a company has been incorporated in Wyoming to build a line from the proposed extension of the Denver, Northwestern & Pacific, near Hayden, Colo., north to coal fields about 20 miles; the line eventually is to be extended to Hahns Peak, Colo., and to Encampment, Wyo. It is also to be extended from Hayden southwest to Pallos. B. L. Dorsey is President; A. A. Johnson, Vice-President and General Manager, and M. E. Johnson, Secretary and Treasurer. This is supposed to be a Denver, Northwestern & Pacific project.

COVINGTON & SOUTHWESTERN.—Incorporated in Indiana with $75,000 capital by W. G. Ruhl, of Chicago; C. W. Winkler and M. H. Campbell to build a line from Covington, Fountain County, on the Cleveland, Cincinnati, Chicago & St. Louis and the Wabash, southwest via Coal Creek to Kingman, in Parke County, approximately 22 miles.

DELAWARE & HUDSON.—This company is planning to at once double-track its line from Scranton, Pa., to Carbondale, 16 miles, and to build new yards in the western part of Wilkesbarre. In addition a new double-track line is to be built from the present road between Moosic and Avoca through Pittston and Plainsville, Pa., about 11 miles, to a connection with the Plymouth branch, which runs from Wilkesbarre, crossing the Susquehanna river, to Plymouth Junction and through the valley to Larksville. Surveys have been made for three different routes. As soon as the choice is made work will be started.

DELAWARE SUBWAY.—Under this name a company in Pennsylvania with $10,000 capital has been granted a charter to build a line along the Delaware river one mile long. One of the termini will be at Front and Market streets, Philadelphia. W. P. Brockermann, 620 Fairmont avenue, Philadelphia, is President.

DEMOPOLIS & LINDEN.—Incorporated in Alabama with $50,000 capital by F. M. Abbott, of Selma, and H. McDaniel and B. G. Wilson, of Demopolis, to build railroads.

DENVER, NORTHWESTERN & PACIFIC.—See Colorado & Northern.

DULUTH, RAINY LAKE & WINNIPEG.—This company, it is said, has completed surveys for extending its road from the present southern terminus at Rainy Junction, Minn., south to Duluth. The line from Virginia to Duluth, about 60 miles, is to be almost an air line. It is said that the Wisconsin Central will permit the company to use its track and terminals in Duluth. Work is now under way

extending the road from its northern terminus at Ashawa north to the Canadian border. (Oct. 19, p. 107.)

FALMOUTH.—Incorporated in Virginia with $25,000 capital to build a line from a point in Stafford County west of Falmouth east to tidewater on the Rappahannock or Potomac rivers, through the counties of Stafford, Spotsylvania, Caroline and King George, about 25 miles. W. E. Grant is President; T. S. Armistead, Treasurer, and A. M. Yonge, Secretary and Manager.

FLORIDA ROADS (ELECTRIC).—A franchise has been granted to the William H. Evers Engineering Company to build an electric line from Tampa, Fla., east via Plant City, Mulberry and Lakeland, to Bartow, about 45 miles.

GREAT NORTHERN.—The report of this company recently issued shows that work is being pushed on the line being built by the Washington & Great Northern and the Vancouver, Victoria & Eastern from Midway to Keremeos, B. C. Grading was nearly completed and track laying was commenced on June 29. On the Brandon, Saskatchewan & Hudson's Bay, from a connection at the international boundary with the Dakota & Great Northern company's extension from St. John, N. Dak., to Brandon, Man., 69.45 miles is completed. The Midland of Manitoba, which the report shows is a subsidiary of this company, is to be completed by November 15 from a connection with the Great Northern at Neche, N. Dak., on the international boundary, north to Portage la Prairie, 77.01 miles.

HUNTSVILLE & BIRMINGHAM (ELECTRIC).—Incorporated in Alabama to build an electric road from Huntsville south through Marshall, Cullman and Blount counties to Birmingham, about 80 miles. C. T. Briggs, of Joppa, is President; L. J. Hanners, of Cullman, Vice-President; T. W. Riddle, of Holly Pond, Secretary, and F. T. Petty, of Huntsville, Treasurer and Attorney. The office of the company will be in Huntsville.

IOWA CENTRAL.—According to reports from Minneapolis, this company and the Minneapolis & St. Louis are planning extensions which will give them a through line over their own tracks from Chicago to Minneapolis. They now use the tracks of the Illinois Central from Albert Lea to Chicago, and when the new line is completed this agreement will end.

KANSAS CITY, MEXICO & ORIENT.—This company has been paid an additional installment of $1,000,000 as subsidy by the Mexican Government. This covers 62 miles of track completed from Minaca, state of Chihuahua west.

MEXICAN ROADS.—President Diaz in his recent message to Congress briefly reviewed railroad construction in Mexico as follows: The railroads under the Federal jurisdiction have built between April and September 15th, 172 miles of new track. The length of railroads in the Republic now aggregates 10,840 miles of track, which, added to 2,588 miles of lines under the jurisdiction of the state governments and the private lines, make the grand total 13,428 miles.

Andres Bermejillo & Company, bankers, of Mexico City, are planning to build a railroad to reach a number of important points in the states of Guanajuanato and Michoacan. The Federal government has granted the necessary concession for the project, which require that the entire road shall be completed within five years, and as soon as the surveys are finished the work of construction will be commenced.

MINNEAPOLIS & ST. LOUIS.—See Iowa Central.

MISSISSIPPI CENTRAL.—This company, operating 83 miles of road in Mississippi from Brookhaven southeast to Hattiesburg, which recently completed a 10-mile extension from its southern terminus, announces that contracts have been let to build an additional 10 miles from the present southern terminus south to near the Harrison County line. Work is also being pushed on the extension from Brookhaven west to Natchez.

MISSISSIPPI ROADS.—The Edward Hines Lumber Co., which owns large tracts of timber lands in Mississippi, is making surveys for a line from Poplarville, Miss., on the New Orleans & North-eastern, southeast to Gulfport, about 50 miles. Work is to be started at once. Right of way through the latter city has been secured. Capt. J. T. Jones, Gulfport, President of the Gulf & Ship Island, is said to be interested in the new project.

W. Denny & Co., of Moss Point, are reported as preparing to at once build a 12-mile extension of their logging road.

MISSOURI & NORTH ARKANSAS.—Announcement is made that this company will make Helena, Ark., its southern terminus. Helena is on the St. Louis, Iron Mountain & Southern. The Railroad Commissioners have extended the time for completion of the road. Contracts for clearing and grubbing, grading, masonry and pile and trestle bridges on the first 75 miles of the southeast extension of this road have been let to Dowling & McGunnigle, St. Louis, Mo., and work will begin at once. The contract calls for the completion of the work in 16 months. Contracts for a 40-mile extension from Seligman, Mo., northwest towards Joplin, Mo., will probably be let within 30 days.

MISSOURI, OKLAHOMA & GULF.—President W. P. Dewar, of this company, has announced that the road, which is already built from Wagner, Indian Territory, to Duston, will be extended at once south to Dennison, Tex.

NATIONAL OF MEXICO.—The main line track between Monterey and Vanegas, 186 miles, is to be relaid with 85-lb. rails. The 70-lb. rails to be removed are to be used to replace lighter rails on the narrow gage portion between Acambaro and Gonzalez, 54 miles, which will later be changed to standard gage.

NEW ORLEANS GREAT NORTHERN.—Contracts have been given by this company to C. D. Smith & Co., for extending its road from Smith Ferry, La., to Jackson, about 50 miles. Work is under way from Bogalusa to Smith Ferry. The company has engineers in the field surveying several branch lines through South Mississippi and North Louisiana.

NEW YORK, NEW HAVEN & HARTFORD.—A contract has been given to Lathrop & Shea, of Brooklyn, for double-tracking the Highland division between Danbury and Hawleyville, 5.6 miles. This work is expected to be completed by June 1 next. The second track west from Danbury to Hopewell, 34.6 miles, has been finished. Several grade crossings on this section between Brewster and Stormville are to be abolished. Contracts for this work have been let to C. W. Blakeslee & Son, of New Haven.

NORTHERN MICHIGAN (ELECTRIC).—Incorporated in Michigan to build an electric line from Manistee, Mich., northeast via Traverse City, Charlevoix and Petoskey to Cheboygan, about 220 miles. Surveys are under way. The project, it is said, is backed by Cleveland capitalists, represented by F. O. Olsen, of Traverse City. The cost of the line will be about $7,000,000.

OCEAN SHORE (ELECTRIC).—This company has resumed work on its 83-mile double-track electric line from San Francisco, Cal., to Santa Cruz, which was suspended after the disaster of April 18th. After some changes in the personnel of the management, arrangements were made to sell enough of the bonds, of which $5,000,000 were authorized, to resume active construction. The road is to run from Army street to Santa Cruz. Twelve miles of track are completed at the Santa Cruz end of the road. Willets & Burr, who have been given a grading contract beyond Ocean Bluffs, near Mussel Rock, will begin work at once. Antonelli & Bandmann have the contract for the completion of the tunnel through the mountain at Point San Pedro.

PATAPSCO & SUSQUEHANNA.—See Baltimore & Ohio.

PENINSULAR (ELECTRIC).—This new line is understood to be a Harriman project, to serve as a feeder to the Southern Pacific's Coast Line. Rights of way have been secured during the past year and large quantities of rails and other materials bought for the speedy construction of the line. It is to be a high-speed electric road from the Twenty-fifth and Valencia street station in San Francisco down the Peninsula and the Santa Clara Valley.

PENOBSCOT BAY.—Incorporated in Maine with $180,000 capital by M. S. Bird, E. S. Bird and H. I. Hix, of Rockland; H. L. Shepard, of Rockport; A. Pierce, of Frankfort; C. Wood, of Camden, and others to build a line from a point on the Maine Central at Rockland, in Knox County, north to a connection with the same road; also to connect with the Northern Maine Seaport at Belfast, in Waldo County, the latter to run via Rockland, Rockport and Camden in Knox County, and Lincolnville and Northport in Waldo County; approximate length of both lines 30 miles.

PHILADELPHIA & READING.—This company, it is said, is considering the question of electrifying its line from Philadelphia to Atlantic City.

PITTSBURG & LAKE ERIE.—See Wabash.

SALEM-MEHAMA (ELECTRIC).—An officer writes that the route of this proposed line is from Salem, Oregon, southeast via Turner and Stayton to Mehama, about 24 miles. Rights of way have been secured and contracts for ties, poles, etc., will be let early next spring. The project is to be financed by A. Welch, of Portland. Surveys and rights of way were made under the direction of Walters Bros., Salem, Oregon. (Oct. 12, p. 99.)

SOUTH & WESTERN.—A contract has been given by this company to the Patton-Richardson Construction Co., Newport News, Va., for a tunnel half a mile long through the mountains near Marion, N. C. The work, which is to be started shortly, will cost about $2,000,000.

SOUTHERN PACIFIC.—The city council of Oakland, Cal., has postponed for three weeks final action on the matter of granting this company an exclusive franchise for a belt line traversing the eastern portion of the city and following the north shore of the tidal

canal. Residents ask that all railroads be given the right to operate trains on the proposed road and have offered to organize within three weeks a new company to build such a line.

This company, it is understood, is trying to buy land necessary for a right of way for the proposed two-mile extension along north beach into the Presidio, at San Francisco. The company has made plans to build a branch line connecting with the belt line, owned by the state, which furnishes switching facilities along the main water front of the city, and been granted a franchise for the two-mile extension needed to reach the Presidio. The new tracks, as surveyed, run through Fort Mason, where Black Point will probably be pierced by a tunnel. The government is preparing to build a supply station at this point with docks and warehouses costing over $1.000,000. Additional land along this right of way that has been partly reclaimed from the bay near the foot of Fillmore street would be valuable for yards and ferry slips.

Trans-Alaska-Siberian.—This company has been incorporated in New Jersey, with $6,000,000 capital, by Loicq de Lobel, of No. 11-bis Rue d'Edinbourg, Paris; J. A. L. Waddell, of Kansas City; John J. Healy, of Seattle, Wash.; William H. Black, of No. 11 Wall street, New York, and John R. Turner, of the Corporation Trust Company, of No. 15 Exchange place, Jersey City. Mr. de Lobel is the general delegate of the French and Russian and American syndicate of the company. Mr. Waddell is the delegate of the advisory board of consulting engineers, and Mr. Healy is the delegate of the western syndicate. The company proposes to build a line between Alaska and Siberia, with a tunnel under the Behring Straits. The line across Alaska, and its branch lines, and a part of the tunnel to the Great Dromede Island, are to be built in accordance with the contract established between the special Imperial commission and the company. The proposed western terminus is Kansk, on the Siberian Railway. The line of the proposed road runs thence easterly to the boundary line of the province of Amur to 123 deg. longitude east of Paris; thence direct to a point between Yakougsk and Okhotsk; then to Behring Straits. The estimated length of the main line is 3,750 miles, and the branches 2,250 miles. On the American side the line is to run from Cape Prince of Wales east along the Tanana river, thence to the Alaska-Canada boundary.

Wabash.—Announcement is made that this company and the Pittsburg & Lake Erie will jointly build a new yard at Sawmill Run, Allegheny County, Pa., which is to be used by both roads. The joint work is also to include the rebuilding of the Little Sawmill Run Railroad, a short Wabash property.

President George J. Gould is quoted as saying that part of the recent issue of bonds is to be used to pay for double-tracking the line between St. Louis and Chicago. One-third of this work has been completed.

Washington, Patuxent & Drum Point.—Incorporated in Maryland to build a double-track line from a point on the Chesapeake Beach Railway, southeast to Drum Point and Solomon's Island, on Chesapeake Bay, about 30 miles. Traffic arrangements will be made with the Chesapeake Beach, with the Pennsylvania at Deanwood, D. C., and with the Baltimore & Ohio at Hyattsville. The names of the incorporators are not given, but it is supposed that George Gould is planning a connecting link from the Western Maryland at Baltimore through Calvert County to Drums Point.

West Shore Traction.—This company has been incorporated in New York with $250,000 capital to operate a street surface line from Orangeburg, Rockland County, north via Piermont, Grand View, South Nyack, Nyack, Upper Nyack and Congress to Haverstraw. The directors are Frank J. Whan, A. J. Whan, E. J. Welsh, N. E. Heine, G. P. Fall, G. S. Fulton, of New York City; A. S. Brown, Brooklyn; E. G. Roff, Jr., Orange, N. J., and E. A. Hilton, Paterson, N. J.

RAILROAD CORPORATION NEWS.

Albany & Susquehanna.—See Delaware & Hudson.

Atchison, Topeka & Santa Fe.—The gross earnings for the three months ended Sept. 30, 1906, were $21.293,596, an increase of $2,598,151; net earnings, $8.255,805, an increase of $1,415,984.

Bangor & Aroostook.—The gross earnings of this company for the year ended June 30, 1906, were $2,496,546, an increase of $337,475; net earnings $951,877, an increase of $169,528; the surplus, after charges and 4 per cent. dividends on the $1,550,000 capital stock, was $72,931, an increase of $1,182. According to the annual report, the Northern Maine Seaport Railroad & Terminal has been operated by the Bangor & Aroostook since November 4, 1905, although the final ballasting and ditching was not finished until last summer. This road, which is leased to the Bangor & Aroostook, runs from La Grange, Me., south to Searsport, 54 miles. It gives the last named road a terminal on the Atlantic ocean at Cape Jellison, where dock and yard facilities are now almost finished.

Buffalo & Susquehanna.—According to the annual report just issued, it is expected that through traffic from Belfast, N. Y., to Buffalo will be begun on January 1st. The southern extension to Sagamore, Pa., has been finished, and with it the company will have nearly 370 miles of road. With an average mileage operated of 243 miles, an increase of 71 miles, the gross earnings for the year ended June 30, 1906, were $1,522,740, an increase of $392,875; net earnings $535,213, an increase of $158,593. Other income decreased while interest on funded debt and other deductions increased, so that the net income was $246,506, a decrease of $77,508, out of which were paid dividends of 4 per cent. on the $4,000,000 outstanding preferred stock and 5 per cent. on the $4,456,900 outstanding common stock.

Canadian Pacific.—The gross earnings of this company for the month of September, 1906, were $6,152,767, an increase of $1,216,000; net earnings $2,437,932, a gain of $661,992. Gross earnings for the three months ended September 30 were $18,291,187, an increase of $4,028,511; net earnings $7,272,322, an increase of $2,066,958.

Chesapeake & Ohio.—This company has sold to Brown Bros. and the Guarantee Trust Company, New York, jointly, $1,600,000 4 per cent. equipment notes secured on 1,000 steel gondolas and 40 locomotives. They are payable in 20 equal semi-annual instalments beginning April 15, 1907.

Delaware & Hudson.—The demurrer filed by this company in answer to the bill in equity filed by the stockholders of the Albany & Susquehanna asking for increased rental has been overruled in the United States Circuit Court. It is expected that a civil action will now be instituted by the committee. If the Albany & Susquehanna protective committee and the new directors who are acting with it are successful, the D. & H. will have to pay 3½ per cent. additional rental on the $2,500,000 A. & S. stock, a total of 12½ per cent., and also back rentals amounting to about 25 per cent. on the stock. (Oct. 19, p. 108.)

Georgia Southern & Florida.—A semi-annual dividend of 2½ per cent. on the $1,084,000 outstanding 5 per cent. second preferred stock has been declared. Since 1900 the annual rate on this stock has been 4 per cent.

Mexican Railway.—This company owns 264 miles of road from Mexico City to Vera Cruz and has 57 miles of branch lines. A dividend of 3¾ per cent. has been declared on the $4,908,000 second preferred stock; this dividend is the first paid on this stock since 1897. The stock is entitled to 6 per cent. annually, but no dividends could be paid until 8 per cent. on the $12,377,385 first preferred had been paid.

New England Investment & Security Co.—Mackay & Co., New York, are offering to exchange 4 per cent. preferred stock of this company for stock of the Worcester Railways & Investment Co. at the rate of 21 shares N. E. I. & S. stock for 20 shares of Worcester Railways & Investment. The New England Investment & Security Company is the new holding company for the New York, New Haven & Hartford electric lines in Massachusetts, and its $10,000,000 4 per cent. cumulative preferred stock is guaranteed by the Consolidated Railway. (Sept. 21, p. 76.)

Pacific Mail Steamship Company.—The report for the year ended April 30, 1906, of this company, which is controlled by the Harriman interests, shows receipts of $5,724,337, a decrease of $51,446; net income of $828,981, a decrease of $466,031. The decrease in earnings was due to the lessening of traffic after the close of the Russian-Japanese war, the Chinese boycott of American goods, the opening of competitive lines and the resumption of service by a Japanese line in November, 1905.

Texas Central.—The Texas Railroad Commission has announced that it intends to order on November 20th the immediate cancellation of $650,000 outstanding Texas Central bonds; these are declared illegal, the commission having refused consent to their issue on the ground that the value of the road, including extensions, for which the bonds were issued, is less than the outstanding capital stock.

Wabash.—According to the plan for the retirement of the debenture "A" and "B" debenture bonds the securities must be deposited with the United States Mortgage & Trust Co., New York, on or before November 30, 1906. The railroad company reserves the right to declare the plan inoperative unless 95 per cent. of the "B" debentures are deposited. (Oct. 26, p. 116.)

Worcester Railways & Investment Co.—See New England Investment & Securities Co.